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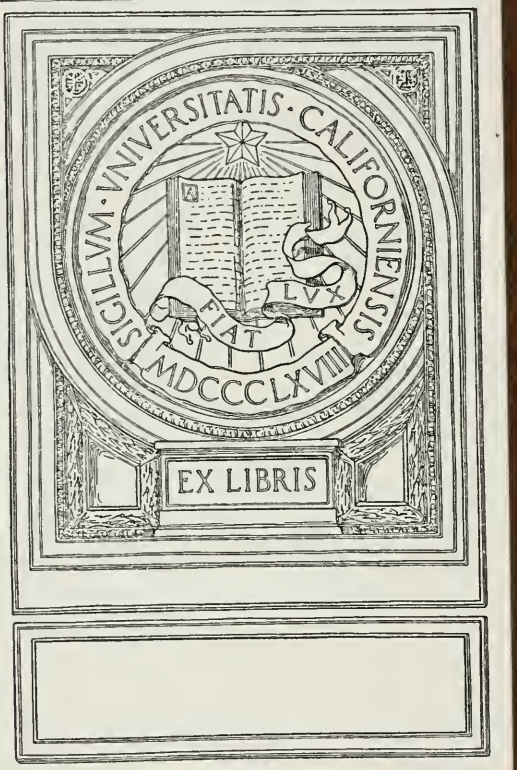
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HARVARD MONOGRAPHS IN EDUCATION

STANDARD EDUCATIONAL TESTS IN THE ELEMENTARY TRAINING SCHOOLS OF MISSOURI

BY
WALTER F. DEARBORN
EDWARD A. LINCOLN
EDWIN A. SHAW

Series 1 No. 3

STUDIES IN EDUCATIONAL PSYCHOLOGY
AND
EDUCATIONAL MEASUREMENTS

Edited by
WALTER F. DEARBORN

JUNE, 1922

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THE GRADUATE SCHOOL OF EDUCATION
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PREFACE

This investigation was undertaken for the Carnegie Foundation for the Advancement of Teaching to secure such evidence as school tests might furnish concerning the results of instruction in the Elementary Training Schools of the State Normal Schools and of the State University of Missouri; and to determine the relative attainments of the schools in these tests as compared with schools elsewhere, and also in comparison with each other.

Part of the material which appears in this study has already been published by the Carnegie Foundation in its report on "The Professional Preparation of Teachers for American Public Schools."* This report, however, was concerned chiefly with the results of the testing and did not emphasize the methods which were used in making the survey and working up the data. Several contributions to the technique of handling the test results were made during this investigation, which may be found useful in other school surveys; so that the republishing of the material, with the emphasis on methods rather than on results, seems desirable.

The report also has a certain historical interest as marking a transition from the observational method of estimating school achievement to the more objective methods of standard tests. At the time when this survey was undertaken,† standard tests had not yet come to be looked upon as a necessary part of such a project. The work of these schools was, therefore, at the same time carefully observed by several educational experts. How useful the tests would prove in supplementing, checking, or challenging the opinions of these observers was a matter about which neither the officers of the Carnegie Foundation nor the present writers were at all certain. The development, therefore, of what was then considered an ambitious plan of testing—eight tests besides the special reading tests were used—was frankly an experiment. The results, however, as the following statement from the official report indicates, furnished ample justification for the experiment. "These tests supplied an indispensable check upon the judgments of the observers, with which they tallied to a surprising degree."‡

*Carnegie Foundation for the Advancement of Teachers, New York, 1920.

†The first testing was done in May, 1916.

‡Professional Preparation of Teachers for American Public Schools, p. 5.

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The writers are indebted to the officers of the Carnegie Foundation for permission to republish the parts of this study which were included in the above-mentioned report and for their cordial co-operation and assistance in the course of the survey.

W. F. D.
E. A. L.
E. A. S.

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STANDARD EDUCATIONAL TESTS IN THE ELEMENTARY TRAINING SCHOOLS OF MISSOURI

§1. THE STANDARD TESTS: METHODS AND PROBLEMS OF MEASUREMENT

The special problems which were met with in this survey, and which are discussed in the following pages, were in large measure due to the small numbers of children in the various groups compared. If the advantages which may result from the use of standard tests are not, however, to be limited to large school systems, these problems must be solved. That they were, for the most part, successfully met in the present instance will, it is believed, be borne out in the following report.

SELECTION OF TESTS

The tests employed were chiefly those in common use, in order that comparisons might readily be made with other schools and school systems. For the examination of reading, however, certain new tests were introduced, partly for the purpose of determining their availability for use in such surveys, and partly for such additional information as they might furnish.* Tests were given in reading, writing, arithmetic, spelling and composition.

GIVING THE TESTS

The tests were given in May, July, and October, 1916. Testing at these different times was necessitated in part by the fact that the sessions of the schools were not coincident. In order to note the possible effect of giving the tests at different times of the year, the school at Cape Girardeau, which was tested in May, was re-tested in October, and comparisons were made between the two sets of results obtained.

A COMPARISON OF TWO TESTINGS OF THE SAME GROUP

These comparisons are expressed in two ways. The central tendencies of the classes are compared, and then the results of correlation studies are shown. It must be held in mind that the former method of comparison is the most significant for the purposes of this report. The fact which this study wishes to determine is whether or not the *average* accomplishment of a class tested in October is approximately the same as the average accomplishment of the same class tested in the preceding

*The results of the special reading tests will be embodied in a later monograph.

May. The attainments of the individual pupils make little difference, for the comparisons of the schools and classes are made on the basis of the central tendencies of the groups compared.

The results are presented in the following tables.

In the Courtis Tests 21 out of 48 medians (44%) are exactly the same in the May and October results. Besides this, 17 October medians (37%) are only one example more or less than the medians of the same classes in May.

There is another way in which the central tendencies may be compared. This is by stating their differences in terms of their variations. For instance, if the May median is 9 examples done, with a P.E. of 1, and the October median is 10, it can be said that the latter is 1 P.E. greater than the former. This gives a more definite unit for comparison, and by the use of it all the comparisons are made on the same basis. In using this method for the purposes of this study the May medians were first taken as the starting points, and the relation of the October medians to them were expressed in terms of the P.E.'s of the former. Then the process was reversed, and the May medians were compared to those found in the October testing in terms of the P.E.'s of the latter. The two sets of results obtained in this way were then averaged.

TABLE 1. COMPARISON OF TWO TESTINGS AT CAPE GIRARDEAU*

a. Courtis Arithmetic Tests

1. *Addition*

Grade	3		4		5		6		7		8	
	"A"	"R"	"A"	"R"	"A"	"R"	"A"	"R"	"A"	"R"	"A"	"R"
May medians	3	0	4	0	6	3	8	3	8	5	9	7
P.E.	1	0	1	2	1	1	2	3	2	2	2	2
October medians	4	1	4	3	6	3	7	5	8	3	9	5
P.E.	1	1	1	1	1	2	1	2	2	2	1	2
2. *Subtraction*												
May medians	3	0	4	2	8	5	8	5	8	7	9	6
P.E.	1	0	1	1	1	1	2	3	2	2	2	3
October medians	3	0	4	2	6	5	6	4	8	6	10	7
P.E.	1	0	2	2	1	1	1	3	1	2	1	3
3. *Multiplication*												
May medians	1	0	3	0	5	3	8	4	7	4	10	6
P.E.	1	0	2	0	1	1	1	2	2	2	1	2
October medians	"O"	"O"	3	2	4	2	6	4	6	4	8	6
P.E.	o	o	1	2	1	1	2	1	2	2	2	4
4. *Division*												
May medians	"O"	"O"	1	0	4	1	5	3	5	4	8	7
P.E.	o	o	1	0	1	1	3	2	2	2	4	4
October medians	"O"	"O"	2	0	3	1	3	2	6	4	9	8
P.E.	o	o	1	0	1	1	3	2	2	2	3	3

*The eighth grade scores are not used in the comparison.

This second method shows that 64% of the medians in one test are within 1 P.E. of the corresponding medians of the other. Another 7% fall at plus 1 P.E., and 21% fall at minus 1 P.E.

It seems fair to conclude on the basis of these figures that the attainments of the classes were not very different in the two series of tests.

TABLE 2. COMPARISON OF TWO TESTINGS AT CAPE GIRADEAU

b. Stone Reasoning Test Scores

Grade	3	4	5	6	7	8
May medians	1.0	2.0	3.0	5.0	7.1	6.9
P.E.	1.0	1.0	1.0	2.0	1.0	3.1
October medians	1.0	2.0	5.0	5.6	7.8	9.2
P.E.	1.0	2.0	1.0	2.4	1.4	1.4

In the Stone test the medians are exactly the same in two grades, and in two others they are very close. This means that 66% of the medians fall within 1 P.E. of each other. The largest difference occurs in the eighth grade, but, as noted, no eighth grades are used in the comparisons.

TABLE 3. COMPARISON OF TWO TESTINGS AT CAPE GIRADEAU

c. Spelling Test Percentages

1. *Ayres List*

Grade	2	3	4	5	6	7	8
May medians	76	84	82	85	80	83	82
P.E.	14	8	13	12	10	13	12
October medians	73	93	89	92	85	83	92
P.E.	18	5	9	7	12	11	12

2. *Boston List*

May medians	57	65	66	57	55	62	64
P.E.	14	14	16	24	27	21	20
October medians	47	44	38	63	70	66	87
P.E.	27	11	18	12	15	14	11

The Spelling tests also give similar results. There are 54% of the medians which fall within the 1 P.E. limit, with 18% at plus 1 P.E. and 11% at minus 1 P.E.

TABLE 4. COMPARISON OF TWO TESTINGS AT CAPE GIRADEAU

d. Holmes Penmanship Speed Tests

1. *One Minute Period*

Grade	2	3	4	5	6	7	8
May medians	42	71	87	103	117	115	131
P.E.	5	5	9	8	7	12	15
October medians	44	60	69	84	100	111	107
P.E.	7	10	6	4	8	14	5

	2. *Four Minute Period*						
May medians	34	60	62	97	106	109	121
P.E.	6	8	10	8	8	9	9
October medians	40	58	72	79	103	113	98
P.E.	9	23	13	12	5	11	7
	3. *Average Speed*						
May medians	38	66	75	100	112	111	127
P.E.	5	3	7	5	7	9	15
October medians	43	59	70	85	102	114	104
P.E.	10	16	8	9	6	14	8

The figures for the speed of writing are not quite so satisfactory, but the medians are not far apart. Nearly half of them (45%) fall within 1 P.E., 18% are at plus 1 P.E., and another 11% are at minus 1 P.E. The first noticeable discrepancy occurs in this set of tests, for 14% of the medians are more than minus 2 P.E. apart, and the same number are separated by a distance of more than plus 2 P.E.

TABLE 5. COMPARISON OF TWO TESTINGS AT CAPE GIRADEAU

e. Holmes Penmanship Quality Tests

	1. *Quality on Speed Test*						
Grade	2	3	4	5	6	7	8
May medians	30	33	35	30	30	40	38
P.E.	3	5	3	3	3	5	9
October medians	30	38	35	45	38	33	45
P.E.	3	2	5	10	2	3	3
	2. *Quality on Dictation Test*						
May medians	35	38	47	53	48	53	60
P.E.	7	5	7	8	2	7	7
October medians	28	35	40	43	43	43	50
P.E.	3	3	5	7	7	5	2

The results in the tests for the quality of writing seem to be the most unsatisfactory of all. Yet even in these tests 32% of the medians are less than 1 P.E. apart, while 21% are at plus and 7% at minus 1 P.E.

TABLE 6. COMPARISON OF TWO TESTINGS AT CAPE GIRADEAU

f. Kansas Silent Reading Test

Grade	3	4	5	6	7	8
May medians	18.1	16.3	23.8	10.6	30.0	23.7
P.E.	9.5	4.6	4.8	2.4	4.2	7.5
October medians	20.7	17.7	20.7	22.4	35.9	34.6
P.E.	8.1	8.3	4.5	5.3	6.2	5.8

In this test the scores are rather close again. 42% of the medians are separated by less than 1 P.E., 25% are at plus 1 P.E., and 8% at minus 1 P.E. Only in the sixth grade is there a considerable difference.

TABLE 7. COMPARISON OF TWO TESTINGS AT CAPE GIRADEAU

g. Holmes Speed of Reading Test

Grade	2	3	4	5	6	7	8
May medians	147	384	237	222	234	463	444
P.E.	60	180	30	42	57	100	81
October medians	137	225	272	231	310	452	499
P.E.	94	38	62	90	52	69	19

Although the absolute differences are rather large in the speed of reading test, comparisons on the basis of the variations show that these differences are not so great as they seem. No less than 64% of the medians fall within the 1 P.E. limit, with 15% at plus 1 P.E., and 14% at minus 1 P.E.

TABLE 8. SUMMARY OF COMPARISONS OF TWO TESTINGS AT CAPE GIRADEAU

P.E.	—5	—4	—3	—2	—1	0	+1	+2	+3	+4	+5
Courtis Tests	0	0	1%	5%	17%	64%	7%	1%	0	0	0
Stone Test	0	0	0	17%	0	66%	9%	8%	0	0	0
Spelling Tests	4%	0	0	7%	11%	54%	18%	7%	0	0	0
Speed of Writing	0	0	2%	19%	3%	43%	12%	10%	7%	0	5%
Quality of Writing	3%	3%	3%	14%	25%	21%	18%	7%	0	0	4%
Kansas Silent Reading	17%	0	0	8%	8%	42%	25%	8%	0	0	0
Speed of Silent Reading		7%	0	0	7%	64%	15%	0	0	7%	0
Combined Tests	3%	1%	1%	10%	14%	52%	12%	5%	1%	1%	1%

Taken as a whole, the results seem to show that the differences between the medians obtained in the two testings were not very great. It seems fair to infer that the attainments of the classes as a whole were not much different in October from what they were in the preceding May.

With one exception, namely, in the quality of writing, the coefficients of correlation in Table 9 are sufficiently high to support the assumption that the work of the classes in the two tests had not changed appreciably. It is to be remembered that, in any repetition of tests, there are a good many factors other than changes in the relative attainments of the pupils which may affect the relative standing of the pupils, and that for the purposes of this report it is chiefly important that the average or median standings of the classes as a whole should not change materially.

TABLE 9. COMPARISON OF TWO TESTINGS AT CAPE GIRADEAU

Correlations of the First and Second Tests

	Test	n	r		P.E.
1.	Courtis Addition Rights	63	73.3	±	3.9
2.	Courtis Multiplication Rights	62	79.1	±	3.2
3.	Stone Reasoning Test	63	83.2	±	2.6
4.	Average Speed of Writing	77	89.6	±	1.7
5.	Quality of Handwriting on Speed Test	79	27.8	±	6.9
6.	Kansas Silent Reading	64	65.3	±	4.9
7.	Speed of Silent Reading	77	59.3	±	5.0
8.	Ayres Spelling List	76	69.3	±	4.0

From the above considerations, it seems fair to assume that neither the lapse of a few months' time nor the possibilities of practice gains had any appreciable effect on the results. In the tabulation of results all pupils were, therefore, listed as members of the grades in which they were enrolled in May.

PERSONNEL OF EXAMINERS

The testing was done by five graduate students* of the Division of Education of Harvard University. Special care was given to the training of the examiners in order that the methods of conducting the tests might be uniform. In the dictation of words for spelling, and in one of the reading tests, the examiners were assisted by selected teachers in the several schools.

TECHNIQUE OF TESTING

The sequence of the tests was arranged to guard in as far as possible against the influence of fatigue. Usually an interval of at least a class period intervened between the various tests. The Courtis and Stone tests were usually given on different days, and whenever possible in the morning hours. The schedule for testing was similar in each of the schools. The attitude of the pupils toward the testing was, it is believed, not essentially different from their attitude toward the regular school work.

*Messrs. H. B. Cummings, L. P. Damon, E. A. Lincoln, C. A. Puckett, and E. A. Shaw.

CORRECTION OF PAPERS

The correcting and scoring of all the papers were done by two, and in some instances, by three of the examiners. In those cases where the personal factor might enter into the rating, every paper was scored independently by each of the readers. The grading of the penmanship papers was done by three of the examiners who practiced until they had attained a high degree of uniformity in their judgments. After practice, their final ratings fell within one step in terms of the Ayres' scale. A similar method was followed with the compositions. All of the papers were read by two of the examiners who had through practice acquired an equal proficiency in rating the papers. When there were small differences in their judgments, the average was taken.

ADVANTAGES OF EXPERT READERS

It is believed that many errors which inevitably appear when the work of correcting is done by teachers and pupils have been eliminated by having a limited number of trained readers for the work. The skill and insight attained by the examiners through practice is accumulative. The time consumed in correcting is decreased, while the accuracy of the work is increased, and the results are interpreted with greater discernment and uniformity.

LIMITED SCOPE OF THE WORK

All that these tests assume to do is to determine the present attainments of the pupils now in the schools. It is quite possible that in some of the classes the pupils are drawn from an inferior school population. It was stated in one school, for example, that many of the pupils were recruited from a "floating" population. Their previous training may thus have been so limited that it would be unfair to hold the school in question responsible for their present attainments.

Some of the classes were very small. In such classes it is, of course, possible to have by mere chance relatively inferior or relatively superior groups. The facts in the case might have been determined, e.g., by supplementary mental tests, had such studies lain within the scope of this investigation.* Some indication of the character of these classes has, however, been secured from a study of the age-grade distribution. In some cases it is evident that these small classes are not representative

*Had the group methods for giving intelligence tests been developed at the time when this survey took place, it would have been an easy matter to determine the important facts about the fundamental abilities of the pupils in the several schools and classes. The extent to which differences in the mental abilities of pupils and classes of pupils may affect the standard test scores has been clearly shown since group intelligence examinations became available. See, for example, School and Society, Vol. XII, No. 306, pp. 441-444.

of the grade of work which is being done; but certain conclusions can be safely made about them, as will be shown later.

Since there are no ninth grades at Kirksville and Maryville, results applicable to the eighth grade could not be obtained in the October testing. The results, as tabulated, are for that part of the eighth grade which was present in May.

PRESENTATION OF RESULTS

The results are stated in the tables in terms of the averages or medians, depending generally on the method of presenting standards with which it is desired to make comparison in this study. It is usually stated that the median cannot be used when the groups are very small, but that the averages must be chosen as the central tendency most representative of such groups. As the finding of the median is much easier and more rapid than finding the average, the data were examined to see if the use of the former could be justified.

The results of this investigation are given, in part, in the accompanying table, No. 10. In this table the averages and average deviations are compared with the medians and median deviations of the same grades in the same tests. The selection of the schools and grades for this comparison was a random one except for the fact that the smaller grades were chosen, as it is in the small groups that averages are supposed to be the most accurate measure.

The table clearly shows that the use of the median was amply justified. In many cases the two scores are exactly the same, and in many more the difference is so slight as to be negligible. In no instance does one of the scores fall outside the probable error or average deviation of the other. The only discrepancies which attract attention are in the speed of silent reading. But here an examination of the facts shows that the median is likely to state the tendency of the group better than the average. The reason for this is that a very high or a very low score has a decided effect on the average in the small group, but does not affect the median. A study of the distributions shows that this is what has happened in the cases where there is a marked disagreement between the average and the median.

TABLE 10. COMPARISON OF AVERAGES AND MEDIANS

	Penmanship		*Silent Reading*			
	Av. Speed	Av. Quality	Speed	Reproduction	Questions	
Average	39	33	189	21	41	
A.D.	8	5	94	14	13	22
Median	38	33	147	14	39	Pupils
P.E.	5	5	60	9	14	Grade 2

Average	33	44	169	33	51	
A.D.	7	7	65	9	9	10
Median	32	42	147	37	53	Pupils
P.E.	12	6	33	9	4	Grade 3
Average	57	39	184	34	40	
A.D.	13	6	60	18	20	16
Median	59	39	180	40	49	Pupils
P.E.	14	4	60	17	8	Grade 4
Average	81	45	321	50	70	
A.D.	15	6	84	12	8	8
Median	83	45	363	57	72	Pupils
P.E.	16	9	81	12	7	Grade 6
Average	82	50	285	51	67	
A.D.	17	8	80	9	12	20
Median	79	48	299	51	72	Pupils
P.E.	18	8	67	11	13	Grade 5
Average	92	41	310	56	69	
A.D.	15	9	78	8	15	12
Median	89	37	291	57	69	Pupils
P.E.	18	7	72	9	14	Grade 7

The variability from the central tendency, i.e., average or median deviation, is stated under the average or median. This figure, taken together with the number of scores from which the central tendency is calculated will indicate the reliability of the averages or medians. Besides the central tendencies of the separate schools, grade averages and medians with their variabilities have been calculated for the combined grades of all the schools taken together. These figures give a basis for further comparisons.

METHODS OF INTER-SCHOOL COMPARISON

Several methods of comparing the relative standing of the various schools and grades have been employed. This has been necessary partly because of the small number of cases involved in most of the comparisons, but also because of other considerations. The average or median standing of the various grades has usually been used in the inter-grade comparisons; but, in the inter-school comparisons since the work of the upper grades is more representative of what the schools have accomplished than that of the lower grades, the standing of the higher grades may properly be given greater weight. Since our tests of the eighth grades are sometimes incomplete, the average or median standing of

the sixth and seventh grades taken together has been secured for this comparison. This method of comparison has been called the *Upper Grade Median Method.*

The average or median of the two grades has been taken rather than that of either grade alone, because the increased number of individuals in the combined grades gave figures that were more reliable, and also because this practice guards to some extent against the effect of one or the other of the grades being by chance exceptionally good or poor. When one of the grades was much larger than the other a random selection of cases was made from it, in order that the combined grade medians might be based upon approximately equal numbers from each grade.

The above method of ranking did not always prove adequate to express all the facts, and in questionable cases several other methods have been used. The supplementary methods employed are the following:

(1) *Progress Method:* Comparison of standing of pupils in each grade with that of the pupils in the preceding grade, with special reference to the standing of the seventh grade as compared with that of the second or third grade. Obviously, the efficiency of a school can be judged in part by the evidence of superior or inferior accomplishment on the part of the latter grades as compared with the earlier grades of the school. It is true that the attainments, e.g., of an exceptional third grade when compared with an inferior eighth might seem to indicate that the school had not accomplished much, and this possibility limits somewhat the usability of the method. The average age of the pupils in such a third grade in comparison with the age of the pupils in the eighth grade may in some instances explain this result. The Progress Method has, therefore, always been supplemented by a study of the age-grade relationships. If, for example, the average age of the pupils in the various grades increases uniformly, but the relative attainments of the pupils advances more rapidly, this can usually be taken as evidence of the superior efficiency of training rather than as evidence of the mere maturity of the pupils. Some very striking evidence of the close relationship between age and school attainment will be pointed out later. For the present it is enough to say that the relationship seems so close that, when there is some irregularity in school progress, a reference to the age-grade table will almost invariably explain the difference. Obversely, the striking instances in this report of the relative superiority of a succeeding grade over a preceding one can in most cases be explained by a reference to the age grade table.

2. *Rank Sum Method:* By this method each of the grades is considered separately. For example, the second grades of all the schools studied are ranked according to their relative standing in a given test. Next, the third and the subsequent grades are handled in the same way. Then the relative standing of the school as a whole is judged by the sum of the first, second, third, etc., ranks secured by the various grades.

This method has the advantage of giving weight to the attainments of the earlier grades, and thus it supplements the first two methods which rate the schools chiefly on the basis of the attainments of the latter grades. It should be said, however, that it is a fair assumption that relative superiority in the earlier grades is likely to be indicative of the selection of a superior group rather than excellence of school training; but this is not always true. Therefore, although it is believed that the first two methods outlined above are on the whole better, it has seemed fair to give some weight in judging the school as a whole to the accomplishments of the pupils of the earlier grades.

(3) *Distribution Method:* At times the best results are obtained by a direct study of the distributions or frequency tables of the results of the tests. These give a record of each individual score, and thus often throw considerable light on the above-mentioned problems of comparison.

The following tables will show two rankings. The first of these will be based on the scores of the combined sixth and seventh grades; the second and final ranking will take into consideration all the other methods of comparison above described.

In order that the reader may fully understand the use of these methods of comparison, the following example is presented, which shows how the final ranking was obtained in the Stone Arithmetic test:

TABLE 11. DISTRIBUTION OF SCORES IN STONE ARITHMETIC TEST

School	0	1	2	3		4		5		6		7		8		9	10	11+		No. Cases VI	VII	Tot.	Med.
Cape Giradeau	0	1.4	2.0	3.0				5.0	5.6		6.6	7.0	7.6	8.0	8.8	9.0							
			2.0	3.0				5.0			6.6	7.2		8.0		9.2				13	13	26	6.6
				3.0				5.2			6.6	7.2											(1.4)
								5.4			6.6												
											6.8												
Columbia			2.0	3.0		4.0	4.6	5.0	5.6	6.0	6.6	7.0	7.6					11.2		11	14	25	5.0
				3.0			4.6	5.0		6.4													(1.6)
				3.0				5.4		6.4													
				3.0				5.4		6.4													
				3.0																			
				3.0																			
				3.0																			
				3.4																			
Kirksville		1.0	2.0	3.0	3.6	4.0		5.0	5.6	6.4	6.6		7.8	8.0	8.8		10.2	11.2		22	18	40	5.0
		1.0	2.0	3.0		4.0		5.0	5.6		6.6												(1.6)
		1.0	2.0			4.0		5.0	5.6														
		1.0	2.0			4.0		5.0	5.6														
		1.0	2.0			4.0		5.2	5.6														
			2.0			4.0		5.4	5.8														
Maryville		1.0	2.0	3.0		4.0		5.4		6.4	6.6	7.8						11.0	13.2	8	8	16	5.4
						4.0		5.4		6.4	6.6												(1.2)
						4.0																	
						4.0																	
Springfield	0		2.4	3.0		4.0	4.6	5.0	5.6	6.4	6.6	7.0	7.6	8.0	8.6	9.0	10.2			15	17	32	5.8
	0			3.0		4.0	4.6	5.2	5.8		6.8	7.0	7.6			9.2							(1.8)
						4.2	4.6	5.4					7.6			9.2							
							4.6						7.8										
Warrensburg	0	1.0	2.0	3.0	3.6	4.0		5.0	5.6	6.4	6.6		7.6	8.0	8.8		10.2	11.2	11.8	21	21	42	4.4
	0	1.0		3.0		4.0		5.4			6.6				8.8		10.2		12.2				(2.2)
		1.0		3.0		4.0		5.4			6.6												
		1.0		3.0		4.0					6.6												
		1.0		3.0		4.0					6.6												
			1.0			4.0					6.8												
						4.4																	

TABLE 12. GRADE MEDIANS IN STONE TEST

Grade	III		IV		V		VI		VII		Rank	Gain of VII
School	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Sum	over III
Cape Giradeau	1.0	**2**	2.0	**2.5**	3.0	**3**	5.0	**1**	7.1	**1**	9.5	6.1
Columbia	1.0	**2**	2.5	**1**	4.6	**1**	4.6	**2.5**	5.2	**5.5**	12.0	4.0
Kirksville	0	**5**	1.0	**4.5**	1.0	**6**	4.0	**4.5**	5.2	**5.5**	25.5	5.2
Maryville	0	**5**	0.5	**6**	3.1	**2**	4.0	**4.5**	6.7	**3**	20.5	6.7
Springfield	1.0	**2**	2.0	**2.5**	2.8	**4**	4.6	**2.5**	6.8	**2**	13.0	5.8
Warrensburg	0	**5**	1.0	**4.5**	2.0	**5**	3.6	**6**	5.6	**4**	24.5	5.6

From the foregoing tables the schools will be seen to rank as follows by the several methods.

Upper Grade Median	Progress	Rank Sum
Cape Giradeau	Maryville	Cape Giradeau
Springfield	Cape Giradeau	Columbia
Maryville	Springfield	Springfield
Columbia	Warrensburg	Maryville
Kirksville	Kirksville	Warrensburg
Warrensburg	Columbia	Kirksville

Cape Giradeau stands first by two methods of comparison, and is second only by a small margin in the third, so is placed first in the final ranking.

Springfield and Maryville are not far apart, but there is considerable evidence for placing the former school in second place. Springfield stands ahead of Maryville by both the Upper Grade Median and Rank Sum methods, and a comparison of the distributions shows a skew toward the upper scores by the Springfield pupils.

Columbia is given the fourth place over Kirksville because of the excellent Rank Sum score, and the superior performance in the lower grades.

An examination of the distributions seems to indicate that Warrensburg should probably not be ranked below Kirksville. The Progress and Rank Sum methods both favor the former, though only slightly. Probably these two schools should rank equally.

NUMBER OF PUPILS TESTED

It has been noted that the small number of pupils tested limits the scope and accuracy of the comparisons and conclusions of the report. The number of pupils is shown in Table 13 by schools and grades. There are several grades which contain less than 10 pupils, and very few of them contain more than 20. It must be remembered also that these figures express the maximum number of pupils tested. Because of absences, the number of papers obtained in any given test was often one or two less than the number appearing in the table.

Columbia has no eighth grade, and, as there are no ninth grades at Maryville or Kirksville, no results for the eighth grade could be obtained in the October testing of this school. For these reasons the results from the eighth grades have not been used in the inter-school comparisons.

Besides the eighth grades mentioned above the second and sixth grades at Maryville, and the third grade at Cape Girardeau were so small that the results are very unreliable.

TABLE 13. NUMBER OF PUPILS BY SCHOOLS AND GRADES

Grade	2	3	4	5	6	7	8	Total
Cape Girardeau	22	9	13	15	13	23	16	111
Columbia	12	10	19	11	13	14	0	79
Kirksville	19	16	17	13	25	19	9	118
Maryville	6	10	10	16	8	12	10	72
Springfield	16	16	16	12	16	17	14	107
Warrensburg	15	21	15	20	21	41	32	165
Grade Totals	90	82	90	87	96	126	81	652

AGES OF PUPILS TESTED

A study of the ages is important because of the light it throws on the question of the mental calibre of the classes. Other things being equal, it is likely that a grade composed of older pupils is an inferior grade, and conversely, a grade composed of younger pupils is likely to be a superior one. For valid comparisons, then, the median ages of the pupils in the grades, schools, or systems compared should be the same.

It is, however, plain from the table of ages (Table 14) that this condition is not fulfilled. The medians of the combined grades progress regularly, and with equal deviations, beginning at 8 years in the second grade, and reaching 14 in the eighth. But in the separate schools this regularity is found only in Columbia. In the seventh grade at Cape Girardeau the median is a year below that of the other seventh grades. That is, half the pupils are 12 years old and under, while in each of the other schools half of the seventh grade pupils are 13 years of age or under. Kirksville has one over-age grade, the fifth, in which more than half the pupils are a year older than the combined grade median. In Maryville, the fifth, seventh, and eighth grades are all above the median age.

Springfield presents the most interesting state of affairs. From the second to the sixth grades, inclusive, the pupils are a year under age as compared with the combined grade medians. But the seventh grade pupils are two years older than those of the sixth; and the eighth grade pupils are two years older than those of the seventh. It is also noticeable that most of the variations in the Springfield medians are

zero, which means that half the class are exactly at the median age. These facts seem to indicate that the upper grades in this school are somewhat inferior when compared with the rest of the school. Assuming this to be so, Springfield will suffer in comparison with the other schools, as it is on the basis of the upper grade scores that the comparisons are chiefly made. An examination of the results seems to show that this is exactly what happens. In many of the tests the Springfield seventh grade will be found to have scores decidedly lower than those of the sixth grade. In Warrensburg there are two grades, the fourth and the sixth, in which the median ages are a year below the combined grade medians.

The age problem may be handled in another way by studying the retardation and acceleration of individuals in each grade. The following tables show the findings on this basis. A pupil was considered retarded if he was two or more years older than the group median age for his grade. He was considered accelerated if he was two or more years younger than the grade median.

TABLE 14. MEDIAN AGES OF PUPILS BY GRADES*

Grade	2	3	4	5	6	7	8
Cape Giradeau	8	9	10	11	12	12	14
	(0)	(0)	(1)	(1)	(1)	(1)	(1)
	22	*9*	*13*	*15*	*13*	*23*	*16*
Columbia	8	9	10	11	12	13	
	(0)	(1)	(0)	(1)	(1)	(1)	
	12	*10*	*19*	*11*	*13*	*14*	*0*
Kirksville	8	9	10	12	12	13	14
	(1)	(1)	(1)	(1)	(0)	(0)	(1)
	19	*16*	*17*	*13*	*25*	*19*	*9*
Maryville	8	9	10	12	12	14	15
	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	6	*10*	*10*	*16*	*8*	*12*	*10*
Springfield	7	8	9	10	11	13	15
	(0)	(0)	(1)	(0)	(0)	(0)	(1)
	16	*16*	*15*	*12*	*16*	*14*	*14*
Warrensburg	8	9	9	11	11	13	14
	(0)	(1)	(1)	(1)	(1)	(1)	(1)
	15	*21*	*15*	*20*	*21*	*41*	*31*
Grade Medians	8	9	10	11	12	13	14
	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	90	*82*	*89*	*87*	*96*	*123*	*80*

*The figures in parenthesis express the median deviations, and the figures in italics tell the number of cases in each grade.

TABLE 15. NUMBER OF PUPILS TWO OR MORE YEARS RETARDED

Grade	2	3	4	5	6	7	8	All Grades
Cape Giradeau	0	0	0	3	3	1	3	10
Columbia	0	0	1	0	3	0		4
Kirksville	4	1	4	3	6	1	2	21
Maryville	2	1	3	3	1	3	3	16
Springfield	0	0	0	0	0	0	1	1
Warrensburg	0	2	1	5	5	6	4	23

TABLE 16. PER CENT OF PUPILS TWO OR MORE YEARS RETARDED

Grade	2	3	4	5	6	7	8	All Grades
Cape Giradeau	0	0	0	20	23	4	19	9
Columbia	0	0	5	0	23	0	—	5
Kirksville	21	6	24	23	24	5	22	19
Maryville	33	16	30	19	6	25	30	21
Springfield	0	0	0	0	0	0	7	1
Warrensburg	0	10	7	25	24	14	13	14

In Kirksville, Maryville, and Warrensburg there is a fairly large amount of retardation throughout the grades. The first two schools have retarded pupils in every grade, the latter in every grade but one. In Cape Giradeau the retardation comes in the last four grades. In both Springfield and Columbia the retardation is negligible except in one grade of the latter school. In Columbia this grade is the sixth. This fact will probably affect the standing of the school in the "upper grade median" method of inter-school comparison.

TABLE 17. NUMBER OF PUPILS TWO OR MORE YEARS ACCELERATED

Grade	2	3	4	5	6	7	8	All Grades
Cape Giradeau	0	0	1	1	1	4	2	9
Columbia	0	0	0	0	0	1	—	1
Kirksville	0	0	1	1	2	0	0	4
Maryville	0	0	0	1	0	2	0	3
Springfield	1	1	1	1	0	1	0	5
Warrensburg	0	2	1	0	9	5	2	19

TABLE 18. PER CENT OF PUPILS TWO OR MORE YEARS ACCELERATED

Grade	2	3	4	5	6	7	8	All Grades
Cape Giradeau	0	0	8	7	8	17	12	8
Columbia	0	0	0	0	0	7	—	1
Kirksville	0	0	6	8	8	0	0	4
Maryville	0	0	0	6	0	16	0	4
Springfield	6	6	6	9	0	7	0	5
Warrensburg	0	10	7	0	43	12	7	12

It is apparent that except in the case of Warrensburg, acceleration in these schools is not nearly as frequent as retardation. Such as occurs is concentrated for the most part in one or two grades. This fact may possibly affect the inter-school comparisons in Maryville and in Cape Girardeau, where the acceleration is fairly large in the seventh grades, and in Warrensburg, where there is acceleration in the sixth grade.

To conclude: The study of the ages of pupils points out probable differences in the mental make-up of the pupils in the different schools, and of pupils of the different grades in the same school, which must be kept in mind when the results from the various schools are compared.

§2. INTER-SCHOOL COMPARISONS

1. Arithmetic Tests

Two series of tests were given in Arithmetic; first, the Courtis Tests, Series B, and second, the Stone Reasoning Tests.

a. *The Courtis Tests.* The Courtis tests, Series B, consist of a set of twenty-four examples for each of the operations in arithmetic: Addition, Subtraction, Multiplication and Division. There is a definite time limit for each set. When the test is given each child is provided with a folder containing the four sets of examples, and is carefully instructed as to what he is to do. At a signal from the tester, all the children begin work on the first set of examples, and they continue until time is called. The same method of procedure is used for each set in turn. Between the second and third sets a short rest period is given the children.

The results of these tests in the Missouri Training Schools are presented in the accepted form for the purpose of comparing them with those of other schools. The results are shown in the body of the report in terms of "Speed" and "Accuracy" in accordance with the more recent tables of Courtis. The scores in the Attempts and Rights, as used in the method hitherto employed, are given in the tables in the appendix. The difference in these two methods of stating results is that the Rights are now calculated in terms of percentages of the number of attempts, and these percentages are termed "Accuracy." "Speed" and "Attempts" may be used interchangeably to indicate the number of examples tried in the allotted time.

The findings in the four fundamental processes of Addition, Subtraction, Multiplication, and Division are stated separately, and a rank in all four of the processes combined has been attempted.

Speed of Addition. The schools will first be ranked in terms of "Speed," or, what is the same thing, in the number of examples attempted. Tables giving the complete results of this and the following tests will be found in the appendix. The tables in the body of the text will embody the main findings only.

TABLE 19. SPEED OF ADDITION

Grade	3	4	5	6	7	6 & 7 combined Score	Rank	Final Rank
Cape Giradeau	3	4	6	8	8	8	1	1
Columbia	2	3	5	7	6	6	5	4
Kirksville	4	4	5	6	6	6	5	5.5
Maryville	5	6	6	7	8	7	2.5	2
Springfield	2	4	6	6	6	6	5	5.5
Warrensburg	3	5	6	6	8	7	2.5	3
All Schools	3	4	6	6	7	6		

As may be seen from the table, Cape Giradeau leads with 8 examples attempted. Maryville and Warrensburg are tied with 7 attempts each. The variability of the Warrensburg median is, however, twice as great as that of Maryville, and since the latter school ranks decidedly superior to Warrensburg by the Rank-Sum method of comparison, it seems that Maryville should have the second place.

In the table, Columbia, Kirksville, and Springfield all rank the same, each having 6 attempts as a median in the combined sixth and seventh grades. From an examination of the distributions it appears that Columbia should be ranked slightly ahead of the other two.

The results in Springfield are striking in that there is no progress after the fifth grade. This suggests the possibility of an inferior seventh grade—a possibility which has already been indicated by the study of the age-grade distributions. This school also has a smaller variability than Kirksville, but on the other hand, the Rank-Sum method shows that they are not materially different.

With all the above considerations in mind it seems that the ranking by the upper grade medians should be modified slightly, and that the final ranking should be as follows: (1) Cape Giradeau; (2) Maryville; (3) Warrensburg; (4) Columbia; (5.5) Springfield and Kirksville.

Accuracy of Addition. In the accuracy of addition Cape Giradeau easily stands in first place, while Springfield and Warrensburg come second and third in the order named. Columbia is placed fourth by the Progress method and because of the good score in the seventh grade. The supplementary methods show the Maryville record better than that of Kirksville. The absence of regular progress in this test, except in the results at Cape Giradeau, is noteworthy and quite the opposite of what might be reasonably expected.

TABLE 20. ACCURACY OF ADDITION

Grade	3	4	5	6	7	6 & 7 combined Score	Rank	Final Rank
Cape Giradeau	0%	20%	43%	60%	67%	63%	1	1
Columbia	0	0	50	33	60	41	5	4
Kirksville	0	25	20	38	50	40	5	6
Maryville	25	67	50	60	40	40	5	5
Springfield	0	25	50	50	64	56	2	2
Warrensburg	0	25	38	33	50	44	3	3
All Schools	0	20	40	44	50	50		

By consulting the corresponding table in the Appendix (Table II), it will be noted that the variability of these median scores is so large in the lower grades as to make them unreliable. This limitation does not

apply so seriously to the scores of the upper grades, although it is still a factor in some schools. It should be kept in mind when examining all the "accuracy" tables.

TABLE 21. SPEED OF SUBTRACTION

Grade	3	4	5	6	7	6 & 7 combined Score	Rank	Final Rank
Cape Giradeau	3	4	8	8	8	8	2.5	2.5
Columbia	1	1	4	6	7	7	4.5	5
Kirksville	1	4	6	5	6	5	6	6
Maryville	2	5	6	9	9	9	1	1
Springfield	4	4	7	8	8	8	2.5	2.5
Warrensburg	3	4	7	5	9	7	4.5	4
All Schools	2	4	6	6	8	7		

Speed of Subtraction. In this test all the methods give nearly the same ranking to the schools. Maryville stands first, with Cape Giradeau and Springfield tied for second place. Warrensburg is placed fourth and Columbia fifth because the latter stands lower by the Rank-Sum method. Kirksville is decidedly behind the other schools.

It is interesting to note the results in Columbia which show that the low standing in the lower grades where the formal arithmetic is not emphasized does not hinder rapid and regular progress afterward with a fairly high score in the last grade.

TABLE 22. ACCURACY OF SUBTRACTION

Grade	3	4	5	6	7	6 & 7 combined Score	Rank	Final Rank
Cape Giradeau	0%	50%	63%	55%	70%	63%	4.5	4
Columbia	0	0	50	43	86	83	1	1
Kirksville	0	0	33	40	60	40	6	6
Maryville	0	80	60	55	67	63	4.5	5
Springfield	25	20	71	75	67	70	3	3
Warrensburg	0	40	60	67	78	77	2	2
All Schools	0	20	60	57	75	67		

Accuracy of Subtraction. Columbia has a substantial lead in this test because of a remarkably high median score in the seventh grade. This is an example of how a single superior grade may affect the results. Cape Giradeau is placed above Maryville because it leads by both the Rank-Sum and Progress methods of comparison. Kirksville stands far behind the other schools.

Again we find little regularity of progress in the various schools, with the exception of Kirksville and Warrensburg. The scores in Maryville decrease from the fourth grade through the sixth.

TABLE 23. SPEED OF MULTIPLICATION

Grade	3	4	5	6	7	6 & 7 combined Score	Rank	Final Rank
Cape Giradeau	"O"	3	5	8	7	8	1.5	2
Columbia	"O"	1	1	3	4	4	5.5	6
Kirksville	"O"	1	3	3	6	4	5.5	5
Maryville	3	5	5	7	8	8	1.5	1
Springfield	"O"	3	5	8	6	6	3.5	3.5
Warrensburg	"O"	3	6	5	7	6	3.5	3.5
All Schools	"O"	2	5	5	6	6		

Speed of Multiplication. Maryville does better than Cape Giradeau by the Progress and Rank-Sum methods, and so is given first place in the final ranking. Springfield and Warrensburg stand very close together. Possibly Warrensburg is slightly in the lead, but not enough to place it a rank ahead. The supplementary methods indicate that Kirksville should be ranked ahead of Columbia. The zero scores in the lower grades mean simply that multiplication is not taught in these grades.

TABLE 24. ACCURACY OF MULTIPLICATION

Grade	3	4	5	6	7	6 & 7 combined Score	Rank	Final Rank
Cape Giradeau	0%	0%	67%	63%	75%	67%	1	1
Columbia	0	0	0	0	57	33	5	5
Kirksville	0	0	25	0	33	20	6	6
Maryville	0	25	75	50	50	50	3.5	3.5
Springfield	0	0	80	67	57	60	2	2
Warrensburg	0	0	50	50	60	50	3.5	3.5
All Schools	0	0	50	50	50	50		

Accuracy of Multiplication. There seems to be no good reason for changing the initial ranking. Maryville leads Warrensburg by the Rank-Sum method of comparison, but the latter school has a decidedly better score in the seventh grade. The large number of zero medians in the third and fourth grades mean that little work in multiplication is done in these grades. This holds true of all the grades up to the seventh in both Columbia and Kirksville. Absence of regular progress

is more noticeable in this test than in those preceding. There is no school in which regular and constant improvement is made throughout the grades.

TABLE 25. SPEED OF DIVISION

Grade	3	4	5	6	7	6 & 7 combined Score	6 & 7 combined Rank	Final Rank
Cape Giradeau	"O"	1	4	5	5	5	3.5	4
Columbia	"O"	"O"	1	2	5	3	5.5	5
Kirksville	"O"	1	2	3	4	3	5.5	6
Maryville	"O"	3	4	5	6	6	1.5	1
Springfield	"O"	2	3	6	5	6	1.5	2
Warrensburg	"O"	2	5	4	6	5	3.5	3
All Schools	"O"	1	4	4	5	4		

Speed of Division. By the Progress and Rank-Sum methods of comparison Maryville leads Springfield, and is therefore ranked in first place. The supplementary methods also place Warrensburg over Cape Giradeau in third place. A study of the distributions shows that the results in Columbia are better than those in Kirksville. The sudden rise in the seventh grade median in Columbia is notable. It probably means that the previous low scores are due to lack of stress on the work. The progress in Maryville and Kirksville is interesting in that each grade does, on the average, one more example than the preceding grade.

TABLE 26. ACCURACY OF DIVISION

Grade	3	4	5	6	7	6 & 7 combined Score	6 & 7 combined Rank	Final Rank
Cape Giradeau	0%	0%	33%	75%	80%	86%	1	1
Columbia	0	0	0	50	60	50	4.5	5
Kirksville	0	0	0	33	50	33	6	6
Maryville	0	60	57	50	60	50	4.5	4
Springfield	0	0	67	71	75	71	3	3
Warrensburg	0	0	60	67	80	80	2	2
All Schools	0	0	50	57	71	67		

Accuracy of Division. In the final ranking only one change has been made. Maryville is placed over Columbia because of a better standing by the Rank-Sum method of comparison. As was the case in Multiplication, the zero medians indicate that the schools do not teach Division in the lower grades to any extent. Progress is more uniform

in this test, as a regular gain is found in every school except Maryville. In the case of the latter school there is a decreasing score in the three middle grades.

In order to get some idea as to the relative standing in the four operations as a group, a table has been made which shows the rank attained by each school in each test. A ranking in the combined operations has also been attempted.

TABLE 27. COMPARISON OF RANKS IN COURTIS TESTS

School	Addition		Subtraction		Multiplication		Division		Four Operations combined	
	S*	A*	S	A	S	A	S	A	S	A
C. Giradeau	1	1	2.5	4	2	1	4	1	2	1
Columbia	4	4	5	1	6	5	5	.5	5	5
Kirksville	5.5	6	6	6	5	6	6	6	6	6
Maryville	2	5	1	5	1	3.5	1	4	1	4
Springfield	5.5	2	2.5	3	3.5	2	2	3	3	2
Warrensburg	3	3	4	3	3.5	3.5	3	2	4	3

It will be seen from the table that the correlation between the standings in the different tests is not a perfect one. There is, however, a decided tendency for a school to hold approximately the same rank throughout the tests in both speed and accuracy, and for this reason the final ranking is probably valid.

A further ranking may be made by combining the standings in speed and accuracy. In this Cape Giradeau stands first. Springfield and Maryville are practically tied for the second place, but the higher rank should probably go to the former school on the basis of greater accuracy in the work. Warrensburg, Columbia, and Kirksville follow in the order named.

b. *Stone Reasoning Test.* In this test the pupils are given a folder which contains twelve problems of graded difficulty. Exactly fifteen minutes are allowed the pupils in which to work as many problems as they can. A certain problem value, as determined by the author of the tests, is credited for each correct answer. The pupil's score in the test is obtained by adding all the credits which he receives.

The following table gives the results in terms of the median scores.

*S—Speed. A—Accuracy.

TABLE 28. MEDIAN SCORES IN STONE REASONING TEST

Grade	3	4	5	6	7	6 & 7 combined Score	Rank	Final Rank
Cape Giradeau	1.0	2.0	3.0	5.0	7.1	6.6	1	1
Columbia	1.0	2.5	4.6	4.6	5.0	5.0	4.5	4
Kirksville	0.0	1.0	1.0	4.0	5.2	5.0	4.5	5.5
Maryville	0.0	0.5	3.1	4.0	6.7	5.4	3	3
Springfield	1.0	2.0	3.6	4.6	6.8	5.8	2	2
Warrensburg	0.0	1.0	2.0	3.6	5.6	4.4	6	5.5
All Schools	1.0	1.6	3.0	4.0	6.4	5.2		

The differences between the schools in this test are not great, and in most cases do not amount to more than the median variations of the scores. In some of the lower grades the scores are not at all reliable because of the great variations.

Cape Giradeau has a slight advantage over Springfield for first place. The latter is very nearly tied with Maryville. The distributions show Springfield somewhat superior, and this school also leads by the Rank-Sum method, while the Progress method favors Maryville. The two schools are evidently not far apart, but the Springfield score is a little more reliable because it is based on a larger number of cases.

From a study of the distributions it also appears that Warrensburg, Columbia and Kirksville differ but little. Columbia is given the fourth place because of the excellent showing made by the Rank-Sum method. The Warrensburg score is not very accurate, as is indicated by the large median deviation and a bimodal distribution.

There is much better progress from grade to grade in nearly every school than was shown in the Courtis tests, and in this the combined grade medians show especially well.

2. Spelling Test

For these tests thirty words were selected for each grade. Twenty of these were taken from the Ayres' Spelling Scale, and the other ten from the Boston Minimum Lists.

The words were not given by the examiners, but were dictated by the regular grade or practice teacher. This was deemed advisable because of the fact that the pupils were more familiar with the voice and enunciation of the teacher.

In the correction of the papers credit was given for accepted forms of simplified spelling, and for wrong words, evidently misunderstood, which were correctly spelled. The necessity for the latter practice could be obviated by using sentences containing test words as a means of giving the examination.

It should be noted in this test that progress through the grades is not made by getting a higher score on the same words, but by maintaining the same score on lists of words of increasing difficulty.

The comparisons are made in terms of averages instead of medians because the standards are so stated.

TABLE 29. PER CENT. OF CORRECT SPELLING OF WORDS FROM AYRES' LIST

Grade	2	3	4	5	6	7	6 & 7 combined Score	Rank	Final Rank
Cape Giradeau	76	84	82	85	80	83	80	1.5	2
Columbia	not given	60	57	66	67	76	72	5	5
Kirksville	67	66	53	73	64	58	61	6	6
Maryville	97	93	73	80	76	76	75	3	3
Springfield	95	85	72	89	81	79	80	1.5	1
Warrensburg	82	65	58	76	79	71	74	4	4
All Schools	81	74	64	78	74	73	76		

a. *Words from Ayres' List.* The standing of the schools is shown in the above table. Springfield ranks slightly higher than Cape Giradeau in the distributions and by Rank-Sum method. The latter school stands ahead by the Progress method, but this is only because the earlier grades in Springfield make such good records.

The differences between Columbia, Maryville, and Warrensburg are very small; by the Upper Grade Median method these schools are practically tied. By the other methods of comparison employed, however, the third place falls to Maryville by a small margin. Warrensburg seems to have a slight advantage over Columbia, although this may be questioned. The Kirksville results are more than a grade behind those of any of the other schools.

TABLE 30. PER CENT OF CORRECT SPELLING OF WORDS FROM THE BOSTON LIST

Grade	2	3	4	5	6	7	6 & 7 combined Score	Rank	Final Rank
Cape Giradeau	57	65	66	57	55	62	63	1	2
Columbia	not given	38	28	35	53	36	44	4	5
Kirksville	36	33	29	59	39	33	33	6	6
Maryville	73	59	38	57	59	37	42	5	4
Springfield	73	61	71	71	74	50	62	2	1
Warrensburg	59	47	31	65	60	43	52	3	3
All Schools	57	50	42	58	55	45	49		

b. *Words from Boston List.* The relative standings of the schools in the spelling of words from the Boston lists is shown in the above table. The reason for the lower scores on the Boston List is that the words are much more difficult than those of the Ayres' list, and the Boston standards were obtained from tests given after the words had been studied by the pupils.

Here again the Upper Grade Median method of comparison is not alone sufficient, and the final ranking must be made by the other methods. These give the first place to Springfield. The fourth place is given to Maryville instead of Columbia because the former school is found to lead decidedly by the Rank-Sum method, and by a study of the distributions. The distributions show that the mode of the combined sixth and seventh grades at Maryville is 10% higher than that of the combined sixth and seventh grades at Columbia. Kirksville is again a grade or more behind the other schools. It is worth noting that the records of some of the schools are better in the lower grades than in the upper. This is especially noticeable in Kirksville, Maryville and Warrensburg.

The average deviations are nearly all very high; some, indeed, so large as practically to invalidate the averages. This means that the range of ability in spelling the words on the Boston list was very great, or that possibly the words were more familiar to some individuals than to others.

3. Penmanship Tests

*The Holmes Test.** The Holmes Test for the Speed of Writing is given as follows: A short sentence† is written on the board by the examiner and copied by the children at the top of their papers. After the directions for the test have been given, the sentence is read in concert by the class several times, so that it is fairly well learned before the test begins, and little or no time is lost by the pupils because of forgotten copy.

After two short practice periods of 15 seconds each, which are given for the purpose of "warming up," the sentence is written repeatedly for a one-minute and a four-minute period. The number of letters written per minute in each period is found, and the average of these is taken as the pupil's speed of writing.

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*This test was arranged by Professor Henry W. Holmes and used with his kind permission. Records for comparison with the present results were also made available through his courtesy.

†The sentence is "Jolly kings bring gifts while happy maids dance." It will be noticed that this sentence contains most of the letters and the common letter combinations.

TABLE 31. SPEED OF HANDWRITING
Letters per Minute

Grade	2	3	4	5	6	7	6 & 7 combined Score	Rank	Final Rank
Cape Giradeau	38	66	75	100	112	111	111	1	1
Columbia	35	32	51	87	89	92	89	3	3.5
Kirksville	31	39	59	69	83	71	79	6	6
Maryville	39	54	51	55	83	89	83	5	5
Springfield	44	69	75	97	110	96	104	2	2
Warrensburg	45	44	60	79	82	92	87	4	3.5
All Schools	40	49	62	80	92	92	93		

Speed of Handwriting. Cape Giradeau easily leads in this test, with Springfield second. Columbia and Warrensburg stand so close together that they cannot be separated by any method of comparison.

In this test there seems to be regular progress through the grades. Three of the schools, however, show no advance after the sixth grade, and in two of these, Kirksville and Springfield, there is a falling off in the seventh grade.

Quality of Writing. The Holmes Test for the Quality of Writing provides for the rating on the Ayres Scale of three samples of the pupil's penmanship. The average of these three ratings is taken as the final score.

The first of the three samples rated was the paper written in the four-minute speed test; the second, a short story written by the pupils from dictation, and the third the "reproduction" paper from the reading test. In the latter case the pupils did not know that the paper was to be graded for penmanship. Each of the papers was rated independently by two of the examiners, and the two ratings were averaged for the score of the paper.

TABLE 32. QUALITY OF HANDWRITING
Scores on Ayres Scale

Grade	2	3	4	5	6	7	6 & 7 combined Score	Rank	Final Rank
Cape Giradeau	33	36	43	39	42	47	42	4	3
Columbia	50	42	46	43	44	49	47	2	2
Kirksville	35	32	39	36	38	35	37	6	6
Maryville	32	41	38	43	45	37	44	3	4.5
Springfield	34	29	33	36	43	40	41	5	4.5
Warrensburg	35	39	43	48	47	51	51	1	1
All Schools	35	36	39	41	42	45	44		

Warrensburg and Columbia stand very close in this test, but the former school has a little the better record in the upper grades. Cape Giradeau, Maryville, and Springfield are practically tied by the Upper Grade Median method of comparison, but the other methods give the advantage to the first school. Maryville would stand higher were it not for the poor record in the seventh grade. Kirksville does quite as well as most of the other schools in the lower grades, but makes no advance in the upper grades. The records of the upper grades are from one to two grades behind the other schools.

While the work of rating the papers was going on, it became evident to the examiners that there was a difference in the quality of the writing on the three different sets of papers. Separate medians were therefore found for each of the tests, and these are given in the table below.

TABLE 33. COMPARISON OF QUALITY OF HANDWRITING ON DIFFERENT TESTS

Grade	2	3	4	5	6	7
Medians in						
Dictation	35	35	40	43	45	50
Speed Test	33	35	35	38	38	43
Reproduction	35	35	40	42	45	45
Average of						
3 Tests	35	35	39	41	42	45

The differences are not very great up to the fourth grade, but thereafter the quality of writing in the Reproduction and the Dictation tests is slightly better than that in the Speed test. In the seventh grade the writing in the Dictation test is of better quality than in either of the other two tests. The quality in the Reproduction test is better than that in the Speed test. It is likely that the quality of writing in the Reproduction test is of most significance, because this was written in the pupils' ordinary handwriting.

The ranking of the different schools is practically the same in all three tests, as may be seen from the tables in the appendix.

For efficiency in writing, a proper balance must evidently be maintained between speed and quality; that is, neither speed nor quality of writing can be bettered at the expense of the other. When both factors are taken into consideration, the Warrensburg school stands first in the ranking. It has the best writing from the standpoint of quality combined with fair speed. Cape Giradeau and Columbia come next, with Springfield, Maryville, and Kirksville following in the order named.

4 Reading Tests

a. *The Kansas Silent Reading Tests.* The purpose of this test is to determine "the ability of pupils to get meaning from the printed

page." It consists of a series of "exercises," in the form of short paragraphs, in which the child is given certain directions to follow or in which he is required to solve a simple problem. Each exercise is so arranged that the response of the child is either right or wrong. A folder containing a set of these exercises is given to each child in the class, and all begin to work at a signal from the examiner. The score is determined by the number of exercises which are completed in five minutes, the weighting of each exercise in the final score having been calculated by the author of the tests.

The median scores obtained in this test are recorded in the following table. The slight decrease in the scores of the sixth grade is due to the fact that two sets of exercises are used, one set for the third, fourth, and fifth grades, and another for the sixth, seventh, and eighth.

TABLE 34. KANSAS SILENT READING TESTS

	Test I			Test II		6 & 7 combined		
Grade	3	4	5	6	7	Score	Rank	Final Rank
Cape Giradeau	18.1	16.3	23.8	10.6	30.0	19.7	1	1
Columbia	6.8	12.4	16.3	15.4	16.3	15.4	4	4
Kirksville	5.2	9.8	12.8	16.8	19.3	18.4	2	2
Maryville	7.2	8.5	14.6	11.7	15.8	12.8	6	6
Springfield	10.5	13.4	18.3	13.5	17.3	13.9	5	5
Warrensburg	10.3	10.3	12.5	12.9	20.1	16.7	3	3
All Schools	8.5	12.4	16.3	13.2	20.0	16.2		

In this test the ranking seems to be the same by all methods. Cape Giradeau stands first; but it should be noted that the pupils in this school had taken this test several times during the year. The difference between any two successive schools is not great, although a fairly large gap exists between the lowest and the highest scores.

As may be seen in the corresponding table in the appendix, the reliability of some of the scores in the third and fourth grades is rather questionable because of their high variability.

b. *Holmes Reading Tests.** In the first of these tests the pupils are given slips of paper on which is printed a simple story, and a period of 20 seconds is allowed for reading. When the signal to stop is given, each child makes a mark under the word which he is reading, and then finishes the reading of the story. When all are done, the class is asked to reproduce the story in writing. Finally, a set of questions on the main points of the story is given, and the pupils are asked to write the answers.

*These tests were arranged by Professor Henry W. Holmes and used with his kind permission.

The speed of silent reading is scored in the number of words read per minute; the reproduction is scored according to the number of ideas which are correctly reproduced by the pupil, and the answers to the questions are marked on a percentage basis according to definite values assigned them.

Before giving this test a similar test was first given to familiarize the children with the mechanics of the test. The material was the same as that used for testing the silent reading in the Cleveland Survey. The schools are not ranked on the basis of this latter test, but the results are given in Table XX of the appendix.

TABLE 35. SPEED OF SILENT READING
Holmes Test

	Words per Minute						6 & 7 combined Score		Final
Grade	2	3	4	5	6	7		Rank	Rank
Cape Giradeau	147	384	237	222	234	463	321	2	2
Columbia	186	147	219	309	327	324	324	1	1
Kirksville	126	207	180	321	264	276	264	5	5
Maryville	180	180	405	363	363	291	309	3	3
Springfield	138	237	188	364	276	237	249	6	6
Warrensburg	141	180	147	299	249	309	276	4	4
All Schools	147	198	198	309	276	318	291		

Speed of Silent Reading. It should be said at the outset of the discussion of this test that many of the scores of the lower grades are unreliable. This is not only because the variations are large, but because the schools do not take the same rank in the practice and the final tests. The sixth and seventh grade medians, however, are not subject to this criticism, and it is on the basis of these scores that the comparisons are made.

Columbia stands first, taking this rank over Cape Giradeau because of a considerably superior performance in the sixth grade. The ranking of the other schools is indicated in the above table.

TABLE 36. REPRODUCTION OF PASSAGE READ

Holmes Test

Grade	Score in Per Cent. 2	3	4	5	6	7	6 & 7 combined Score	Rank	Final Rank
Cape Giradeau	14	66	60	63	63	69	69	1	1
Columbia	29	37	29	57	49	57	49	6	6
Kirksville	11	43	40	51	60	63	63	2	2
Maryville	41	29	43	51	57	57	57	3.5	3.5
Springfield	26	49	54	49	57	54	57	3.5	3.5
Warrensburg	14	29	43	51	51	57	54	5	5
All Schools	20	37	43	51	54	60	57		

Reproduction Tests. In the reproduction of the passage read Cape Giradeau ranks first. It is noticeable that this school makes very little progress in this test, as the median of the third grade is nearly as high as that of the seventh. The ranking of the other schools may be seen in the accompanying table. None of the methods of comparison gave sufficient evidence for breaking the tie between Maryville and Springfield.

TABLE 37. ANSWERS TO QUESTIONS ON PASSAGE READ

Holmes Test

Grade	Score in Per Cent. 2	3	4	5	6	7	6 & 7 combined Score	Rank	Final Rank
Cape Giradeau	39	71	77	73	77	85	82	1	1
Columbia	53	53	44	68	70	73	70	4	3.5
Kirksville	19	39	49	64	69	68	69	5	5.5
Maryville	44	49	54	69	72	69	72	3	3.5
Springfield	38	59	68	77	78	77	77	2	2
Warrensburg	19	44	44	72	68	68	68	6	5.5
All Schools	37	50	52	69	72	72	73		

In the answers to questions on the passage read Cape Giradeau again takes first place, with Springfield second. The other four schools rank very close to one another, but the supplementary methods place Columbia and Maryville above the other two schools.

5. Composition Test

For this test the pupils of the seventh and eighth grades were asked to write a composition on any one of three following subjects: "The Most Exciting Day of My Life," "An Animal I Have Known," and "Something I Have Made." These topics were such that the pupil had a rather wide range of choice, while the product was kept fairly uniform.

The compositions were graded by the Harvard-Newton Composition Scale.

TABLE 38. COMPOSITIONS

School	Grade 7	8	Final Rank
Cape Giradeau	74	75	1
Columbia	70	..	3
Kirksville	64	72	4.5
Maryville	67	69	4.5
Springfield	75	75	2
Warrensburg	57	65	6
All School	67	70	

The comparisons in this test are based on the scores of the seventh grades alone because there is no eighth grade in Columbia, and the scores for the eighth grades at Kirksville and Maryville are based on so few cases as to be unreliable.

The medians show that there is little difference between Cape Giradeau and Springfield, but the distributions seem to indicate that the former school should have first place in the ranking. Columbia comes third, and is really a little more in advance of Maryville than the medians show. Kirksville and Maryville are so close that they are given the same rank. Warrensburg comes last, and is about a grade behind the other schools.

6. Final Ranking of the Schools

By way of summarizing the inter-school comparisons a final ranking of the schools on the basis of the results in all the tests has been made. Such a ranking, it is realized, must be made largely on the judgment of the investigators, and is likely to cover up more than it shows; as is apt to be the case when combinations of results are made. For the schools, the teachers, and the supervisory officers the most important things by far are the individual results; comparisons can be made only if great care is used in their interpretation.

The following tables give a summary of the findings presented in this section, together with the final ranking of the schools. The sign "&" in Table 39 indicates that two schools are tied in rank.

TABLE 39. SUMMARY OF RANKINGS IN ALL TESTS

		Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6
Courtis Tests	Addition—Speed	C. Giradeau	Maryville	Warrensburg	Columbia	Kirksville	& Springfield
	Addition—Accuracy	C. Giradeau	Springfield	Warrensburg	Columbia	Maryville	Kirksville
	Subtraction—Speed	Maryville	C. Giradeau & Springfield		Warrensburg	Columbia	Kirksville
	Subtraction—Accuracy	Columbia	Warrensburg	Springfield	C. Giradeau	Maryville	Kirksville
	Multiplication—Speed	Maryville	C. Giradeau	Springfield & Warrensburg		Kirksville	Columbia
	Multiplication—Accuracy	C. Giradeau	Springfield	Maryville & Warrensburg		Columbia	Kirksville
	Division—Speed	Maryville	Springfield	Warrensburg	C. Giradeau	Columbia	Kirksville
	Division—Accuracy	C. Giradeau	Warrensburg	Springfield	Maryville	Columbia	Kirksville
	Stone Arithmetic Test	C. Giradeau	Springfield	Maryville	Columbia	Kirksville	& Warrensburg
Spell.	Ayres' List	Springfield	C. Giradeau	Maryville	Warrensburg	Columbia	Kirksville
	Boston List	Springfield	C. Giradeau	Warrensburg	Maryville	Columbia	Kirksville
Pen.	Speed	C. Giradeau	Springfield	Columbia & Warrensburg		Maryville	Kirksville
	Quality	Warrensburg	Columbia	C. Giradeau	Springfield & Maryville		Kirksville
	Kansas Silent Reading	C. Giradeau	Kirksville	Warrensburg	Columbia	Springfield	Maryville
Reading	Speed—Holmes	Columbia	C. Giradeau	Maryville	Warrensburg	Kirksville	Springfield
	Reproduction—Holmes	C. Giradeau	Kirksville	Maryville & Springfield		Warrensburg	Columbia
	Questions—Holmes	C. Giradeau	Springfield	Columbia & Maryville		Kirksville	& Warrensburg
	Composition	C. Giradeau	Springfield	Columbia	Kirksville & Maryville		Warrensburg

TABLE 40. SUMMARY OF RANKS GIVEN EACH SCHOOL

	Courtis Tests								Spell.			Pen.		Reading						
	Addition—Speed	Addition—Accuracy	Subtraction—Speed	Subtraction—Accuracy	Multiplication—Speed	Multiplication—Accuracy	Division—Speed	Division—Accuracy	Stone Test	Ayres' List	Boston List	Speed	Quality	Kansas	Speed—Holmes	Reproduction—Holmes	Questions—Holmes	Compositions	Total of Ranks	Final Standing
Cape Giradeau	1	1	2.5	4	2	1	4	1	1	2	2	1	3	1	2	1	1	1	31.5	1
Columbia	4	4	5	1	6	5	5	5	4	5	5	3.5	2	4	1	6	3.5	3	72	5
Kirksville	5.5	6	6	6	5	6	6	6	5.5	6	6	6	6	2	5	2	5.5	4.5	95	6
Maryville	2	5	1	5	1	3.5	1	4	3	3	4	5	4.5	6	3	3.5	3.5	4.5	62.5	3
Springfield	5.5	2	2.5	3	3.5	2	2	3	2	1	1	2	4.5	5	6	3.5	2	2	52.5	2
Warrensburg	3	3	4	2	3.5	3.5	3	2	5.5	4	3	3.5	1	3	4	5	5.5	6	64.5	4

The tables show that Cape Giradeau easily ranks first. This school stands either first or second in all but three of the tests. Springfield stands second, while Maryville and Warrensburg are about tied for third place, with the advantage slightly in favor of the former. Columbia comes fifth, and Kirksville last—considerably below the other schools.

The relative standing of the schools is not, however, the most significant thing that the results of the tests show. Of much greater importance is the fact of the wide variation between these schools. Although there are, in practically every test, two or more schools in which the attainments are very close, yet in every test the difference between the highest and the lowest score is considerable. It does not seem that such variations should exist between schools which are engaged in similar work. Since it is unlikely that the selection of pupils or their general intelligence is sufficiently different in the various schools to produce such results, the explanation must be looked for in differences in the quality and amount of school training.

§3. COMPARISON OF RESULTS IN MISSOURI WITH RESULTS IN OTHER SCHOOL SYSTEMS

But few of the tests given above have been tried out in schools of sufficiently different character, location, and social condition to furnish a basis for reliable comparisons between schools which differ in these respects. Comparisons must, therefore, be made with the utmost caution. They should, moreover, be interpreted for the most part by teachers and supervisory officials who are in close touch with prevailing conditions.

As pointed out earlier in this report, recent developments in group methods for the measurement of intelligence have made it possible to investigate the native abilities of the pupils in various classes, schools and communities with results which force us to conclude that these abilities vary to considerable extent. It is, therefore, probably no more valid to compare the scores of a group of pupils in arithmetic without any consideration of their general mental levels than it would be to compare them without any reference to their attained school grade. It has been shown already that considerable evidence exists, especially in the age distributions, for supposing fundamental differences between the quality of the pupils in the various Missouri schools. It is altogether probable that like differences exist between the Missouri pupils and those from whose records the several standards were obtained.

In comparing the results in the schools studied above with results obtained elsewhere, it must, therefore, be kept in mind that the comparisons are made in many instances between schools of very different character and condition.

1. Arithmetic Tests

Courtis Tests. The standards chosen for comparison in this test are, in the first place, the latest* standards published by Courtis. These standards were obtained by giving the tests to several thousand pupils in all parts of the country. They include, however, very few results from Missouri or neighboring states.

The second set of standards consists of the results in three public systems of the state. These are more valuable than the above standards for the comparisons because it may be assumed that they were obtained from a somewhat similar school population.

As the results are much the same in all four operations, detailed comparisons will be made only for the results of the test in addition. The reader may easily make comparisons for himself of the results of the other tests by a study of the comprehensive tables in the appendix.

*At the time when this report was originally prepared.

TABLE 41. SPEED OF ADDITION IN COURTIS TESTS

Grade	3	4	5	6	7	8*
Training Schools	3	4	6	6	7	8
Courtis Standards	4	6	8	10	11	12
Columbia, Mo.	..	5	6	7	8	..
Piedmont, Mo.	3	6	5	6	6	7
Excelsior Springs, Mo.	..	6	6	6	7	8

Speed of Addition. The training schools are, throughout, from one to three grades behind the Courtis standards. Except in the third and fourth grades no one of the schools equals or surpasses these standards. On the other hand, some of the scores compare favorably with those obtained in the three public schools. In the three upper grades there is little difference.

TABLE 42. ACCURACY OF ADDITION IN COURTIS TESTS

Grade	3	4	5	6	7	8
Training Schools	0%	20%	33%	33%	57%	50%
Courtis Standards	41	64	70	73	75	76
Columbia, Mo.	..	60	50	43	63	..
Piedmont, Mo.	25	50	40	50	50	57
Excelsior Springs, Mo.	..	33	33	67	57	63

Accuracy of Addition. In this test the training schools are from two to four and a half grades behind the Courtis standards. Only four grades out of the whole number, three in Maryville, and one in Cape Giradeau, are approximately equal to the standard scores. Compared with the public schools the training schools fare little better in the lower grades, but in the seventh grade the results are about equal.

As has already been stated, the results in the other operations are all practically the same as those in addition. The training school scores are uniformly from one to five grades behind the Courtis standards, with only a single grade here and there equalling or approximating the latter. Comparisons with the scores from the Missouri public schools show that the training school scores are about equal to the lowest medians in the former group.

The joint performance of grades 4 to 8 inclusive of the training schools in the Courtis Tests in comparison with the Courtis Standards is shown graphically in Chart B on p. 46. The extreme of variation in the schools in grades 6 and 7 is also shown in the chart.

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*The results of the eighth grade are, of course, incomplete, as they do not include any grade VIII pupils from Columbia, and only part of those from Kirksville and Maryville.

TABLE 43. STONE REASONING TEST

Grade	3	4	5	6	7	8
Training Schools	1.0	1.6	3.0	4.0	6.4	7.0
Starch Standards	4.5	6.2	7.8	9.4	11.0	12.6
Butte, Mont.	..	..	2.2	3.9	5.8	7.7
Laporte, Ind.	..	..	3.4	4.6	8.1	8.6
Salt Lake City, Utah	..	..	3.7	6.4	8.6	10.5
Boston, Mass., 1916	..	..	..	4.4	5.6	7.6
Brookline, Mass., 1916	..	..	4.0	6.2	..	..
Fall River, Mass., 1917	..	..	..	5.0	7.6	..

Stone Reasoning Test. The standards seem to fall into two groups, and the scores in one of these is considerably higher than those in the other. The training school medians are very close to the lower set of scores, running in some grades a little above, and in others, a little below. In none of the schools do the scores equal those of the higher group.

2. Spelling Tests

TABLE 44. AYRES' SPELLING TEST

Grade	2	3	4	5	6	7	8
Training Schools	81%	74%	64%	78%	74%	73%	77%
Ayres Standard	79	79	79	79	79	79	79
Brookline, Mass.	..	..	84	87	89	90	86
Fall River, Mass.	..	..	..	..	86	89	..

Words from Ayres' List. The words were so chosen that the standard score in each grade was 79%. The results in the training schools are only slightly below this standard, except in the fourth grade, where the average is about a grade below.

The Brookline scores are approximately a grade ahead of both the training school and the standard averages, and the same may be said of the Fall River averages.

Many of the grades in Cape Giradeau, Maryville, and Springfield show results which are higher than the Ayres standards, and which are approximately equal to the Brookline averages. It is interesting to note that in Columbia, where little attention is given to formal spelling work, the Ayres standard is practically attained in the seventh grade. Some of the results at Warrensburg and Kirksville are especially low.

TABLE 45. BOSTON SPELLING WORDS

Grade	2	3	4	5	6	7	8
Training Schools	57%	50%	42%	58%	55%	45%	57%
Brookline, Mass.	..	..	61	69	84	66	80
Fall River, Mass	..	..	..	..	72	60	..

Words from Boston List. The results with the Boston list are not as satisfactory as with the Ayres list, but this was to be expected because the words are harder and not so familiar to the pupils. The Boston scores with these words run from 86 to 95 per cent., but this is only after the words have been studied for one or two lessons. The question arises: Would a period or two of training on the Boston list of words in these schools raise the average so as to approximate the Boston standards? This is an experiment that the schools might well make.

The training school scores are also decidedly below those of Brookline where the conditions of testing were the same. Among the training schools there is none which even approximates the standards. Maryville is the only school in which any of the averages are over 70 per cent.

3. Penmanship Tests

TABLE 46. SPEED OF WRITING

Grade	2	3	4	5	6	7	8
Training Schools	40	49	62	80	92	92	102
Newton, Mass.	39	55	59	73	85	94	102
Brookline, Mass.	..	..	..	76	87	90	98
Fall River, Mass.	..	..	..	..	86	89	..

Speed of Writing. The training school medians are very close to those of the schools chosen for comparison. In the fifth and sixth grades they surpass slightly these other schools. There are many cases of low scores in the individual schools, but these are for the most part in the lower grades, which matters little, since we are concerned chiefly with the final product of the schools. The only exception to this is a low score in the seventh grade at Kirksville, which is about two grades behind the scores attained elsewhere.

TABLE 47. QUALITY OF WRITING

Grade	2	3	4	5	6	7	8
Training Schools	35	36	39	41	42	45	47
Newton, Mass.	54	50	45	48	51	50	53
Brookline, Mass.	..	..	..	44	46	47	49
Starch Standards*	27	33	37	43	47	53	57
South Bend Standards*	..	40	40	50	50	60	60
Cleveland, Ohio*	..	..	..	45	48	50	55
Fall River, Mass.	..	..	..	..	44	47	..

*The test given in this case was not the Holmes Test, but the writing was rated on the Ayres Scale.

Quality of Writing. The training school medians are, after the fourth grade, from one to two grades behind the standards. There is not much variation between the schools except for the fact that Kirksville stands far below the rest, making no advance from grade to grade, and not surpassing the second grade median even in the seventh grade.

4. Reading Tests

TABLE 48. KANSAS SILENT READING TESTS

Grade	3	4	5	6	7	8
Training Schools	8.5	12.5	16.3	13.2	20.0	18.4
Standards	6.0	9.9	13.7	13.4	16.5	18.8

Kansas Reading Tests. The standards for this test are the medians obtained from the results of giving the test to about 9000 pupils in 19 different cities. The training school medians are well above the standards except in the sixth and eighth grades, where the two are equal. The superiority of the training schools amounts to about two grades in the seventh and about one grade in the third, fourth, and fifth grades.

Cape Giradeau is in a class by itself in this test, but this is doubtless due to practice, as the test had been given previously in this school. Since the high scores in this school might influence the medians of the combined grades, these were found for the other five schools alone. The only appreciable difference is in the combined eighth grade median, which fell to 15.0, which is approximately equal to the seventh grade standard.

In the other schools there are very few grades in which the medians do not practically equal the standards. The chief exception to this is the seventh grade, in which the training school scores are all high. There are also several high medians in the Springfield grades; whereas in some of the grades at Kirksville and Maryville the scores are low.

TABLE 49. SPEED OF SILENT READING

Grade	2	3	4	5	6	7	8
Training Schools	147	198	198	309	276	318	363
Holmes Standards	...	...	...	249	276	309	309
Brookline, Mass.	...	...	...	249	283	309	309
Fall River, Mass.	...	...	...	...	270	309	...

Speed of Silent Reading. In this test the record of the training schools is a little better than the standards. The combined fifth grade median seems extraordinarily high, and is probably due to some factor of selection, which is not apparent.

There is no one school which is uniformly above or uniformly below the standards in all grades, but each school has some high and some low scores. In Kirksville the low medians are found in the upper grades.

TABLE 50. QUALITY OF REPRODUCTION OF PASSAGE READ

Grade	2	3	4	5	6	7	8
Training Schools	20%	37%	43%	51%	54%	60%	60%
Holmes Standards	..	..	..	54	54	60	60
Brookline, Mass.	..	..	..	57	57	57	60
Fall River, Mass.	..	..	..	..	54	57	..

Reproduction Tests. In the quality of reproduction of passages read there is little difference between the training school medians and the standards. Such differences as there are come in the fifth grade.

Only a few of the grade scores in the various schools are far removed from the standard medians. In Cape Giradeau the scores are consistently above the standards; in every grade after the second they equal or surpass the eighth grade standard.

TABLE 51. ANSWERS TO QUESTIONS ON PASSAGE READ

Grade	2	3	4	5	6	7	8
Training Schools	37%	50%	52%	69%	72%	72%	75%
Holmes Standards	..	..	..	63	69	72	73
Brookline, Mass.	..	..	..	62	64	68	73
Fall River, Mass.	..	..	..	..	66	69	..

In the answers to questions about the passages read, the training school medians are again not very different from the Holmes standards. They are from a grade to two grades ahead of the results in the Brookline and Fall River schools. As in the preceding test, the Cape Giradeau scores are very high from the third grade on.

5. Composition Test

TABLE 52. COMPOSITION TEST

Grade	7	8
Training Schools	67	70
Newton, Mass.	..	75
Bloomington, Ind.	61	67
Port Townsend, Wash.	53	58
Brookline, Mass.	..	70
Fall River, Mass.	65	..

In the composition test for the seventh grade, the training school medians are considerably above those of the schools with which they are compared, with the exception of Fall River. The difference is not so large in the eighth grade, but it must be remembered that the Missouri figures in this grade are not complete.

The differences between the medians in the separate schools and the standards follow in the main the same course as the combined grade medians. The scores in Cape Giradeau, Columbia, and Springfield are especially high.

6. Summary

On the whole, it may be said that the training schools compare not unfavorably with the other schools in which records are available. At least, it may be said that there are some standards in each set of results which the training school medians equal or surpass. The greatest discrepancies come in the results of the Courtis tests, but, although the training school medians are from one to five grades below the Courtis Standards, they are very close to the results obtained in three Missouri public schools. The general tendency seems to be for the training school combined grade medians to fall about half a grade below the standards.

Among the various schools, the Cape Giradeau and Springfield medians tend to surpass the standards, while the results from Kirksville are almost uniformly below. This is another evidence of rather wide variation among the schools.

§4. PROGRESS IN THE SCHOOLS

METHODS OF STUDY

Attention was called in Section 1 to the fact that the efficiency of a school may be judged, in part, at least, by the advance in the various subjects which the pupils of the school make from grade to grade. This was one of the methods used above to estimate the rank of a school. As was pointed out in the previous discussion, this method may lead to false conclusions since we are not dealing with the progress of the same pupils through the grades, but with the comparative standing of different pupils in the various grades. For example, if we compare a relatively inferior second grade with a relatively superior eighth grade, the results attained in that school would appear to be greater than they really are, as would be apparent had we been able to trace the actual improvement of this second grade from year to year up to the eighth grade. Or the opposite comparison may be made, namely, between a relatively superior second grade and a relatively inferior eighth grade. In this case the school would not be given credit for the improvement which would probably have been found, had we been able to follow the progress of the same individual pupils from this second grade until they reached the eighth grade.

It is to be noted, however, that when comparisons are made in many different subjects of study the relatively inferior and the relatively superior grades are likely to be discovered, since the high or the low scores are generally maintained consistently in all the various subjects of study. By such observations as these and by other like considerations, mentioned in Section 1, e.g., the comparative ages of the pupils in question, it is possible to make valid comparisons. It should, however, always be kept in mind that the progress discussed below is not that of the same pupils, but that of the school as a whole. The records simply tell how much superior the standing of the eighth grade pupils is to that of the second grade pupils in the same school. If the average second grade pupil writes at the rate of 39 letters per minute and the average eighth grade pupil writes at the rate of 102 letters per minute the amount of progress in the rate of writing in this school is 63 letters per minute.

An important element in the comparison is the uniformity or regularity in the progress from grade to grade. There may be a regular advance in each grade, or all the gains may be made in one or two grades with little or no gain in the other grades. Grading of pupils and the outlining of courses of study is done, for the most part, in the belief that regular and uniform progress is the rule. It will be interesting to see in how far the facts brought to light in this study justify this belief.

The facts in regard to school progress are shown more clearly in the accompanying diagrams. Tables of numerical results are added in the appendix. It was not considered desirable to make diagrams for all the tests; the following selection was made:

1. Courtis Test, Speed of Addition.
2. Courtis Test, Accuracy of Addition.
3. Stone Reasoning Test.
4. Speed of Penmanship.
5. Quality of Penmanship.
6. Speed of Silent Reading.
7. Quality of Reproduction of Passage Read.

GRADE PROGRESS IN COMBINED GROUP

The Progress lines for all the schools taken together are shown in the last diagram, Chart A. They indicate, for the most part, a steady and gradual gain in the average attainments of the pupils from the second to the eighth grade. In many cases the lines do not rise as rapidly after the sixth grades as they do before this grade. This is what we should expect, because intensive drill in the formal subjects is about finished by the end of the sixth grade.

There is one noticeable exception to the general regularity of improvement. In several of the tests the scores of the fifth grade are as high as or higher than the scores of the sixth grade. This is especially noticeable in the speed of silent reading, and in the speed of addition. There is a slight improvement in the accuracy of addition.

GRADE PROGRESS IN THE SEPARATE SCHOOLS

1. *Cape Giradeau.* The third diagram from the left side of page shows the lines of progress for Cape Giradeau. The first four of these lines, representing the work in arithmetic and the speed of writing, show fairly steady progress through the grades. In the quality of the writing there is a decided rise in the fourth grade, but otherwise the progress is uniform. The speed of reading, however, gives a very odd line of progress. The third grade score is very high, followed by a decided drop in the fourth, fifth and sixth grades, and a marked gain in the seventh grade. The progress in the reproduction test is unlike that in any of the other tests. There is again a sudden rise in the third grade, followed by a plateau which is broken only by a slight rise in the seventh grade.

The high scores in the third grade may be due to the fact that the number of pupils in this grade is very small (only eight in most of the tests) and that they are possibly a select group. The low scores of the

CHART A. PROGRESS OF TRAINING SCHOOLS FROM GRADE TO GRADE IN CERTAIN SELECTED ABILITIES

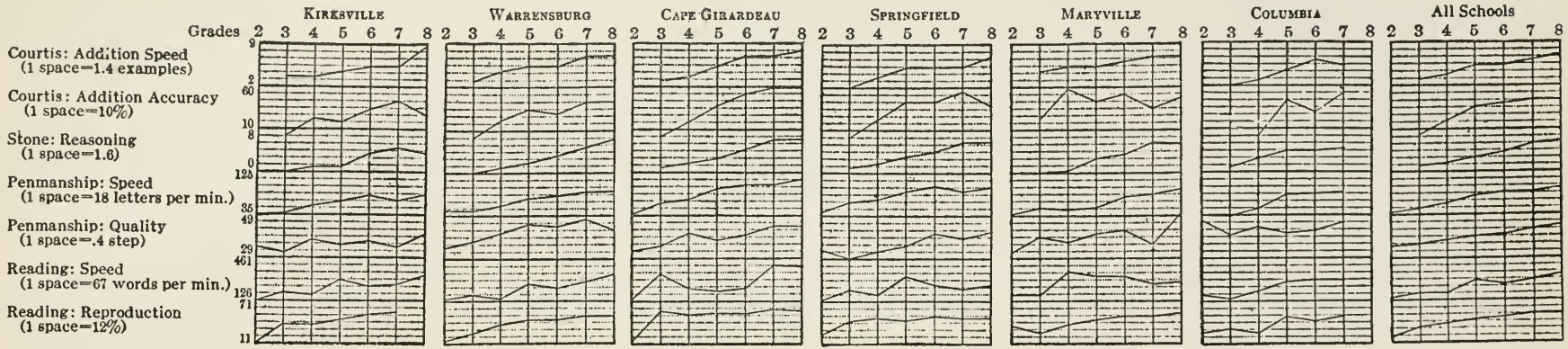
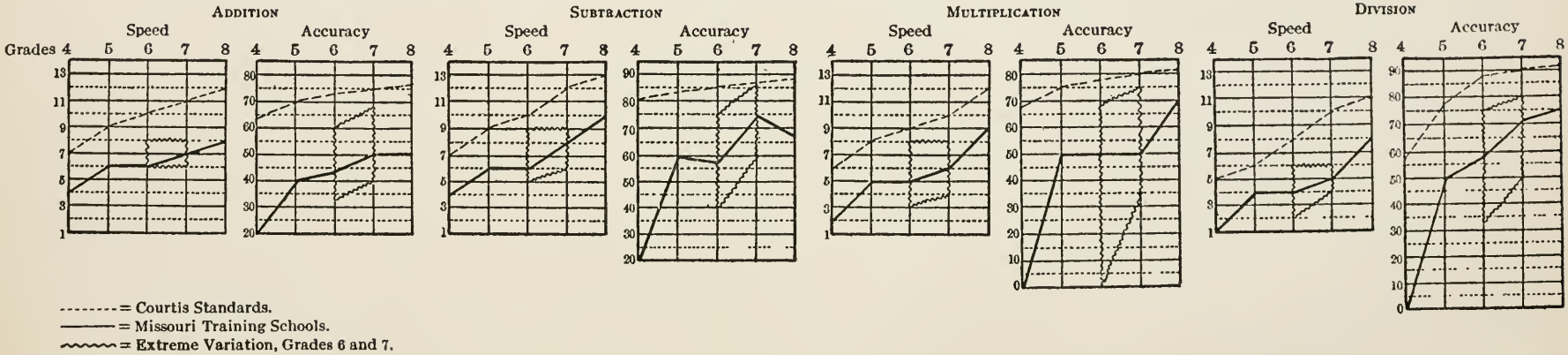


CHART B. JOINT PEFORMANCE OF TRAINING SCHOOLS IN COURTIS TESTS WITH EXTREME VARIATIONS IN GRADES SIX AND SEVEN



-------- = Courtis Standards.
——— = Missouri Training Schools.
~~~~ = Extreme Variation, Grades 6 and 7.
~~~~

fourth, fifth, and sixth grades in the speed of silent reading, may be counterbalanced in part by the high scores in these same grades in the quality of reproduction of the passage read.

When compared with the progress lines of the whole group the Cape Giradeau lines are for the most part parallel to the former and somewhat above them. This is especially true in the later grades, which shows that this school makes more than the average progress. Even in the speed of silent reading where the Cape Giradeau medians are below in the fifth and sixth grades, the seventh and eighth grade medians are considerably above those of the combined group.

2. *Columbia.* The progress in Columbia is shown in the next to the last diagram of Chart A. The most striking feature in this school is the plateau which occurs from the fifth grade on in nearly every test. This may be explained variously. It may be caused by the fact that little attention is given to the formal side of the studies in this school, especially in the later grades, or the seventh grade may be a relatively inferior grade. As there is no eighth grade in this school, it is not possible to get further evidence on this point. It should be said in passing that if the second explanation is true, this fact has caused Columbia to suffer in the comparisons with the other schools.

Another noticeable fact is that the quality of writing is high throughout all the grades of this school. When compared with the lines of the combined group the Columbia results are seen to be, in general, slightly lower, with the exception of the fifth grade; but the record in the quality of penmanship is everywhere above that of the combined group.

3. *Kirksville.* In the first diagram of the chart showing the grade progress in Kirksville there is no uniformity in the advances in the various subjects and no general tendency which can be observed. Regularity of progress is shown to some extent in the speed of addition, in the speed of writing through the sixth grade, and in the quality of reproduction. The other lines are very irregular. In comparison with the combined group the results at Kirksville are, with the exception of the record in the quality of reproduction, uniformly lower. This is especially true of the upper grades.

4. *Maryville.* In the diagram for the grades at Maryville, the lack of uniformity in progress is again the main feature. The line representing the Stone test shows the most regular progress; there is also considerable regularity in the gains made in the speed of addition. In the speed of silent reading, the line slopes downward from the fourth grade on, and in the quality of reproduction there is a marked plateau in the progress of the last four grades. Because of this irregularity, comparison with the combined group is difficult.

5. *Springfield.* The Springfield diagram brings out clearly the fact to which attention has been called previously, namely, that the seventh grade in this school seems to be a poor one. In five out of the seven lines there is no rise between the sixth and seventh grades, and in most cases there is a noticeable drop. Up to the sixth grade, the progress is in most cases regular. In the speed of reading, the line shows the most irregularity, and it is especially noticeable for the downward trend from the fifth grade on. In the quality of reproduction there is a plateau from the third grade on to the eighth.

A general statement concerning the relation of the Springfield lines to those representing the combined schools can hardly be made. In both the arithmetic tests and in the speed of writing, the Springfield records are slightly above the combined record, whereas in the quality of writing the combined record is higher, except in the sixth grade. In both the speed of silent reading and the quality of reproduction the tendency is for the school to be somewhat above in the earlier grades and somewhat below in the later grades.

On the whole, it may be said that the progress in this school is satisfactory, if the influence of what seems to be a relatively inferior seventh grade is discounted.

6. *Warrensburg.* The Warrensburg lines of progress indicate the most satisfactory state of affairs that is found in any of the schools. Progress seems to be steady and regular in all the tests. Only a few isolated scores break the regularities of the lines, and these are not important. In nearly all cases the records are very close to those of the combined group. The only exceptions are in the case of the Stone test, which is a little below, and in the quality of writing, which is a little above the standard.

SUMMARY

The study of the progress in the schools again brings out the fact that there are many inter-school differences, as well as inequalities in the same school and grade in the standing of the pupils in the several subjects of study. Although there are many cases of regular and continued progress through the grades, the ups and downs in the records show altogether too frequently that grade standards are lacking. Many of the irregularities are doubtless to be explained by the limitation pointed out at the beginning of this section, namely, that the progress has not been measured by the attainments of the same groups of pupils in successive years; but the fact still remains that, in many instances, grade position gives litttle or no indication of the character of work or the attainments of the pupils.

§5. CORRELATIONS

METHODS

The question of the relative standings of pupils in the various tests raises an interesting set of problems. A few of the possible correlations having practical as well as theoretical interest have been studied below. Most of the correlations were calculated by the Spearman "foot-rule" formula and then translated into the equivalent co-efficients of correlation of the Pearson method.* Since there is some question concerning the reliability of this method of calculation, a number of the correlations were also obtained by the usual Pearson formula as a check on the results. As will be seen below, the results by the two methods were in sufficient agreement to justify the use of the shorter method alone in the remaining correlations. The various studies are reported in the tables which follow.

TABLE 53. CORRELATION BETWEEN THE SPEED AND QUALITY OF WRITING

	Number of Cases	r	P.E.
Cape Giradeau	107	.60*	.04
Columbia	74	.12†	.07
Kirksville	97	.48	.05
Maryville	72	.26	.07
Springfield	99	.44	.05
Warrensburg	161	.36	.05
All Schools	610	.49	.02

RESULTS

The Relation of Speed to Quality of Writing. In all the schools, with the exception of Cape Giradeau, the correlation between the speed and the quality of writing is low. In Columbia there is little or no relationship, and the correlation is also especially low at Maryville. This would seem to indicate a lack in the co-ordinate development of these two phases of penmanship.

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*By means of Table 37, p. 169 of Thorndike's "Mental and Social Measurements." The formula is $r = \sin(\sigma/2)R$, in which "r" stands for the Pearson co-efficient and "R" for the Spearman.

*In this case the Pearson Co-efficient was .60.

†In this case the Pearson Co-efficient was .17.

TABLE 54. CORRELATION BETWEEN QUALITY OF WRITING IN SPEED TEST AND QUALITY OF WRITING IN REPRODUCTION TEST

	Number of Cases	r	P.E.
Cape Giradeau	104	.63*	.04
Columbia	73	.73	.03
Kirksville	92	.63†	.04
Mayrville	72	.70‡	.04
Springfield	98	.78	.03
Warrensburg	164	.69§	.03
All Schools	603	.72	.01

The Quality of Writing in Two Different Tests. In one of these tests the pupils knew that their penmanship was being tested and would be graded; in the other, the reproduction test, they did not suspect that the quality of writing would be especially considered. The degree of correlation, as shown in the above table, may, therefore, indicate the extent to which the instruction in penmanship has "carried over" to the ordinary school work of the pupils. The inter-school differences are, in this case, unimportant.

TABLE 55. CORRELATION BETWEEN THE SPEED OF SILENT READING AND THE QUALITY OF REPRODUCTION OF PASSAGE READ

	Number of Cases	r	P.E.
Cape Giradeau	104	.35	.06
Columbia	75	.37	.07
Kirksville	84	.52	.05
Maryville	71	.22	.07
Springfield	100	.23	.06
Warrensburg	159	.44	.04
All Schools	593	.39¶	.02

The Speed of Reading and the Quality of Reproduction. The correlations between the speed of reading and the ability to reproduce accurately what is read are, in general, of small amount, and are especially so in Maryville and Springfield. The highest correlation is attained at Kirksville. Since the correlations, although positive, are of small amount, they do not altogether bear out the statement commonly

*In this case the Pearson Co-efficient was .61.
†In this case the Pearson Co-efficient was .58.
‡In this case the Pearson Co-efficient was .62.
§In this case the Pearson Co-efficient was .74.
¶The Pearson Co-efficient is also in this case .39.

made that the fast readers also retain or reproduce best what they have read. Most of the studies bearing on the matter have been made on adults, and the question has not been sufficiently studied in the case of children. The differences found may well be in part the result of differences in the methods of school training.

TABLE 56. CORRELATION BETWEEN THE QUALITY OF REPRODUCTION AND THE ANSWERS TO QUESTIONS IN THE HOLMES READING TEST

	Number of Cases	r	P.E.
Cape Giradeau	106	.70	.03
Columbia	75	.76	.03
Kirksville	82	.77	.03
Maryville	70	.55	.05
Springfield	102	.48	.01
Warrensburg	158	.68	.03
All Schools	593	.70	.01

Quality of Reproduction in Different Tests. The correlation studied in table 56 is one in which a very high co-efficient is to be expected, for the two tests are evidently similar in character. The chief difference is that the questions cover the main points of the story, while the reproduction calls for all the details that can be remembered. The correlations are lowest in Maryville and Springfield. These are the same schools in which there was little relation between the speed of reading and the quality of reproduction. There is some lack of uniformity in the results from the several schools, although the differences are not large.

TABLE 57. CORRELATION BETWEEN THE REPRODUCTION OF A PASSAGE READ TO THE PUPILS AND A PASSAGE READ BY THEM

	Number of Cases	r	P.E.
Cape Giradeau	100	.75	.03
Columbia	72	.80	.03
Kirksville	31	.59	.08
Maryville	69	.53	.06
Springfield	96	.58	.05
Warrensburg	157	.56	.03
All Schools	525	.64	.01

"Auditory" and "Visual" Reproduction. The passage read to the pupils was very similar in form to the passage read by them. It was a short story, based upon thirty-five ideas, which was read to each

class by the teacher or her assistant. After it had been read through once, the pupils were asked to write what they could remember of the story in exactly the same way as was done in the case of the corresponding passage which they had read for themselves.

As may be seen in the above table, there is a fair amount of correlation in the standings of pupils in the two tests. The majority of those who do well in one test do well in the other. School training may have a very considerable effect on the result, and it is, therefore, worthy of note, in view of the different methods of training practiced at Columbia, that the highest correlation is found in that school.

§6. RECOMMENDATIONS AND SUGGESTIONS FOR FURTHER STUDY

The findings of this investigation will gain in value if they may be supplemented by the comments and interpretation of the teachers and supervisors who are conversant with the special characteristics, aims, problems, and limitations of the several schools, and if they may receive rigorous criticism and discussion. In this way only will the findings presented secure their proper evaluation.

The large differences between the accomplishments of the pupils in the various schools certainly deserve further attention. Some of these differences may be due to factors which have not been adequately canvassed in this study; but for the most part, they are to be attributed to differences in the standards and quality of instruction. Unless the mental calibre of the pupils in the various schools is very different, it should be possible for these schools to maintain approximately equal standards of scholarship. If certain schools are handicapped by the grade of pupils received for instruction, this fact should be ascertained and brought to the attention of the normal school students who are serving as practice teachers in these schools. Otherwise, the latter may easily be satisfied with lower standards in the schools and classes over which they are subsequently put in charge, to the detriment of instruction throughout the state.

One way of obviating this difficulty would be to arrange for an exchange of practice teachers between the state normal schools. Such a practice might well lead to greater uniformity of standards and to practical co-operation between these schools.

It may need again to be emphasized that the examiners are well aware that standing in these tests of the more formal activities of school children is not the sole criterion of school efficiency; but it is believed that when certain schools fall far below the attainments of other schools in the formal subjects, it may well be inquired whether or not these schools are giving compensating advantages. The causes of interschool differences may, therefore, be profitably investigated. If individual weakness or merit is exposed, it should not be for the purpose of drawing invidious distinctions, but in order to lead to helpful co-operation between the schools.

After such comparisons, each school should be free to work out its own standards. When once its standards have been set up, the tests are useful to determine whether or not the requirements are being met in the separate classes. In this connection it should be noted that if school tests are given too prominent a place there is danger that some teachers will be encouraged to over-stress the drill in the formal subjects

in order to keep the classes up to the standards. They will do this to the neglect of other subjects of study in which the results of instruction are not as tangible or as easily measured. This is a difficulty which can be met only by efficient supervision.

By the use of these tests it is possible to single out pupils who need individual attention. Even the best of teachers are not always cognizant of the limitations and needs of individual pupils. A cross-section of a pupil's abilities such as is given by a series of tests frequently reveals facts about him hitherto unrecognized.

When these school tests are supplemented, as they may well be in many individual cases, by "intelligence" tests, not only is the proper differentiation of backward or defective pupils for special class work or individual instruction made more certain, but pupils of superior endowment may not infrequently be recognized and given opportunities for more rapid advancement or specialization of instruction.

In such ways may the findings of this investigation be profitably extended.

APPENDIX

§1. COMPLETE TABLE OF RESULTS

In this section will be found comprehensive tables giving the complete results of the study.

Unless otherwise noted, the results are stated in medians which are the figures in the first line under each school. The second line of figures show the median deviations or probable errors. The figures in italics are the number of cases from which the above measures are calculated.

In the Courtis tests "A" stands for "attempts" and "R" for "rights."

TABLE I

COURTIS TESTS: SPEED OF ADDITION

Grade	3		4		5		6		7		8	
	A	R	A	R	A	R	A	R	A	R	A	R
Cape Giradeau	3	0	4	0	6	3	8	3	8	5	9	7
	1	0	1	2	1	1	2	2	2	2	2	2
	9		*12*		*15*		*13*		*21*		*15*	
Columbia	2	0	3	0	5	2	7	2	6	4	. .	.
	1	0	1	0	1	1	2	1	2	1	. .	.
	10		*18*		*11*		*12*		*14*			
Kirksville	4	0	4	1	5	1	6	2	6	3	10	1
	1	0	1	0	1	1	2	1	2	2	4	1
	16		*17*		*12*		*22*		*18*		*8*	
Maryville	5	1	6	4	6	4	7	5	8	3	8	5
	1	1	1	2	1	2	2	2	1	1	1	2
	10		*10*		*16*		*8*		*12*		*9*	
Springfield	2	0	4	1	6	3	6	4	6	4	8	3
	1	0	1	1	2	2	2	2	1	1	2	2
	14		*15*		*12*		*16*		*16*		*14*	
Warrensburg	3	0	5	1	6	3	6	2	8	4	8	4
	1	0	1	1	1	2	1	2	1	2	1	2
	20		*15*		*20*		*21*		*41*		*30*	
All Schools	3	0	4	1	6	2	6	2	7	4	8	4
	1	0	1	1	1	2	1	2	1	2	1	2
	79		*87*		*86*		*92*		*122*		*76*	
Courtis Standards*	4		6		8		10		11		12	
Columbia, Mo.	. .	.	5	3	6	3	7	3	8	5	. .	.
	. .	.	*142*		*145*		*124*		*119*			
Piedmont, Mo.	3	1	6	3	5	2	6	3	6	3	7	4
	50		*34*		*26*		*47*		*29*		*19*	
Excelsior Springs, Mo.			6	2	6	2	6	4	7	4	8	5

*Bulletin No. 4. Courtis Standard Research Tests, issued by The Department of Co-operative Research, 82 Eliot St., Detroit, Mich.

TABLE II

COURTIS TESTS: ADDITION ACCURACY

Grade	3	4	5	6	7	8
Cape Giradeau	0	20	43	60	67	67
	0	20	18	27	13	15
	9	*12*	*15*	*13*	*21*	*15*
Columbia	0	0	50	33	60	..
	0	0	27	19	22	..
	10	*18*	*11*	*12*	*14*	*0*
Kirksville	0	25	20	38	50	30
	0	11	20	22	25	30
	16	*17*	*12*	*22*	*18*	*8*
Maryville	25	67	50	60	40	55
	25	33	50	23	15	16
	10	*10*	*18*	*8*	*12*	*9*
Springfield	0	25	50	50	64	43
	0	25	25	17	19	14
	14	*15*	*12*	*16*	*16*	*14*
Warrensburg	0	25	38	33	50	50
	0	15	25	19	17	14
	20	*15*	*20*	*21*	*41*	*30*
All Schools	0	20	40	44	50	50
	0	20	23	23	17	20
	79	*87*	*86*	*92*	*122*	*76*
Courtis Standards	41	64	70	73	75	76
Columbia, Mo.	..	60	50	43	63	..
		142	*145*	*124*	*119*	..
Piedmont, Mo.	25	50	40	50	50	57
	50	*34*	*26*	*47*	*29*	*19*
Excelsior Springs, Mo.	..	33	33	67	57	63

TABLE III

COURTIS TESTS: SUBTRACTION

Grade	3		4		5		6		7		8	
	A	R	A	R	A	R	A	R	A	R	A	R
Cape Giradeau	3	0	4	2	8	5	8	5	8	7	9	6
	1	0	1	1	1	1	2	3	2	2	2	2
	9		*12*		*15*		*13*		*24*		*15*	
Columbia	1	0	1	0	4	2	6	3	7	6	.	.
	1	0	1	0	1	1	2	2	1	1	.	.
	10		*18*		*11*		*12*		*14*		*0*	
Kirksville	1	0	4	0	6	2	5	1	6	3	8	3
	1	0	1	0	3	2	1	1	2	2	2	1
	16		*17*		*12*		*22*		*18*		*8*	
Maryville	2	0	5	4	6	4	9	5	9	6	10	7
	1	0	2	1	1	2	2	2	1	2	1	1
	10		*10*		*16*		*8*		*12*		*9*	
Springfield	4	1	4	1	7	5	8	6	8	5	10	6
	1	1	1	1	0	2	2	2	2	2	2	2
	14		*15*		*12*		*16*		*16*		*14*	
Warrensburg	3	0	4	2	7	4	5	3	9	7	10	7
	1	0	1	1	1	1	1	1	2	2	2	2
	20		*15*		*20*		*21*		*41*		*30*	
All Schools	2	0	4	1	6	4	6	3	8	6	10	6
	1	0	1	1	1	1	2	2	2	2	2	3
	79		*87*		*86*		*92*		*122*		*76*	
Courtis Standards	5		7		9		11		12		13	
Columbia, Mo.	.	.	6	3	6	4	8	5	10	8	.	.
			142		*146*		*124*		*118*			
Piedmont, Mo.	2	0	4	2	5	2	6	3	6	3	8	6
	47		*35*		*25*		*48*		*29*		*19*	
Excelsior Springs, Mo.	.	.	6	2	7	3	8	5	9	5	10	7

TABLE IV

COURTIS TESTS: SUBTRACTION ACCURACY

Grade	3	4	5	6	7	8
Cape Giradeau	0	50	63	55	70	67
	0	25	20	33	13	18
	9	*12*	*15*	*13*	*24*	*15*
Columbia	0	0	50	43	86	..
	0	0	17	32	3	..
	10	*18*	*11*	*12*	*14*	*0*
Kirksville	0	0	33	40	60	50
	0	0	33	27	26	20
	16	*17*	*12*	*22*	*18*	*8*
Maryville	0	80	60	55	67	70
	0	30	26	18	21	8
	10	*10*	*16*	*8*	*12*	*9*
Springfield	25	20	71	75	67	60
	25	20	15	14	19	13
	14	*15*	*12*	*16*	*16*	*14*
Warrensburg	0	40	60	67	78	73
	0	11	18	13	13	16
	20	*15*	*20*	*21*	*41*	*30*
All Schools	0	20	60	57	75	67
	0	20	23	26	15	15
	79	*87*	*86*	*92*	*122*	*76*
Courtis Standards	49	80	83	85	86	87
Columbia, Mo.	..	50	67	63	80	..
	..	*142*	*146*	*124*	*118*	..
Piedmont, Mo.	0	50	40	50	50	75
	47	*35*	*25*	*48*	*29*	*19*
Excelsior Springs, Mo.	..	33	43	63	56	70

TABLE V

COURTIS TESTS: MULTIPLICATION

Grade	3		4		5		6		7		8	
	A	R	A	R	A	R	A	R	A	R	A	R
Cape Giradeau	0	0	3	0	5	3	8	4	7	4	10	6
	1	0	2	0	1	1	1	2	2	2	1	2
	9		*12*		*15*		*13*		*24*		*15*	
Columbia	"0"	"0"	1	0	1	0	3	0	4	2	. .	.
	0	0	0	0	0	0	1	0	1	2		
	10		*18*		*11*		*12*		*14*		*0*	
Kirksville	"0"	"0"	1	0	3	1	3	0	6	2	10	0
	0	0	1	0	2	1	1	0	1	1	3	0
	16		*17*		*12*		*22*		*18*		*8*	
Maryville	3	0	5	1	5	3	7	4	8	5	8	3
	1	0	1	2	1	1	2	1	1	2	2	2
	10		*10*		*16*		*8*		*12*		*9*	
Springfield	"0"	"0"	3	1	5	4	8	5	6	3	8	4
	0	0	1	1	1	1	2	1	1	1	2	2
	14		*15*		*12*		*16*		*16*		*14*	
Warrensburg	"0"	"0"	3	0	6	3	5	2	7	4	9	5
	0	0	1	0	1	2	2	2	1	2	2	2
	20		*15*		*20*		*21*		*41*		*30*	
All Schools	"0"	"0"	2	0	5	3	5	2	6	4	9	4
	0	0	2	0	1	2	2	2	2	2	2	2
	79		*87*		*86*		*92*		*122*		*76*	
Courtis Standards	0		6		8		9		10		11	
Columbia, Mo.	. .	.	5	2	5	3	7	4	10	7		
			139		*146*		*129*		*118*			
Piedmont, Mo.	2	0	4	1	5	2	5	3	6	4	8	5
	47		*31*		*24*		*47*		*29*		*19*	
Excelsior Springs, Mo.			5	2	5	2	6	4	7	5	9	5

TABLE VI

COURTIS TESTS: MULTIPLICATION ACCURACY

Grade	3	4	5	6	7	8
Cape Giradeau	0	0	67	63	75	55
	0	0	16	19	25	17
	9	*12*	*15*	*13*	*21*	*15*
Columbia	0	0	0	0	57	..
	0	0	0	0	29	
		18	*11*	*12*	*14*	*0*
Kirksville	0	0	25	0	33	0
	0	0	25	0	17	0
		17	*12*	*22*	*18*	*8*
Maryville	0	25	75	50	50	43
	0	25	25	17	12	10
	10	*10*	*16*	*8*	*12*	*9*
Springfield	0	0	80	67	57	45
	0	0	13	8	17	20
		15	*12*	*16*	*16*	*14*
Warrensburg	0	0	50	50	60	70
	0	0	17	36	20	20
		15	*20*	*21*	*41*	*30*
All Schools	0	0	50	50	50	50
	0	0	30	30	25	20
		87	*86*	*92*	*122*	*76*
Courtis Standards	..	67	75	78	80	81
Columbia, Mo.	..	40	60	57	70	..
		139	*146*	*129*	*118*	..
Piedmont, Mo.	0	25	40	60	67	63
	47	*31*	*24*	*47*	*29*	*19*
Excelsior Springs, Mo.	..	40	40	67	71	56

TABLE VII

COURTIS TESTS: DIVISION

Grade	3		4		5		6		7		8	
	A	R	A	R	A	R	A	R	A	R	A	R
Cape Giradeau	"0"	"0"	1	0	4	1	5	3	5	4	8	7
	0	0	1	0	1	1	3	2	2	2	4	4
	9		*12*		*15*		*13*		*21*		*15*	
Columbia	"0"	"0"	"0"	"0"	1	0	2	1	5	2	. .	.
	0	0	0	0	0	0	1	1	2	1		
	10		*18*		*11*		*12*		*14*			
Kirksville	"0"	"0"	1	0	2	0	3	1	4	2	4	1
	0	0	1	0	1	0	2	1	1	1	4	1
	16		*17*		*12*		*22*		*18*		*8*	
Maryville	"0"	"0"	3	1	4	2	5	3	6	3	6	4
	0	0	2	1	1	1	3	2	1	1	2	1
	10		*10*		*16*		*8*		*12*		*9*	
Springfield	"0"	"0"	2	0	3	2	6	4	5	4	9	7
	0	0	0	0	1	1	1	2	1	1	1	2
	14		*15*		*12*		*16*		*16*		*14*	
Warrensburg	"0"	"0"	2	0	5	3	4	2	6	4	7	6
	0	0	1	0	2	2	1	1	2	2	2	2
	20		*15*		*20*		*21*		*41*		*30*	
All Schools	"0"	"0"	1	0	4	1	4	2	5	3	8	6
	0	0	1	0	1	1	2	2	2	2	3	2
	79		*87*		*86*		*92*		*122*		*76*	
Courtis Standards	0		4		6		8		10		11	
Columbia, Mo.	. .		3	1	3	1	4	3	9	7		
			139		*144*		*124*		*119*			
Piedmont, Mo.	. .		3	0	4	1	3	2	4	2	7	5
			23		*25*		*48*		*28*		*18*	
Excelsior Springs, Mo.	. .		. .		3	1	6	5	7	6	8	6

TABLE VIII

COURTIS TESTS: DIVISION ACCURACY

Grade	3	4	5	6	7	8
Cape Giradeau	0	0	33	75	80	83
	0	0	33	25	20	9
		12	*15*	*13*	*21*	*15*
Columbia	0	0	0	50	60	..
	0	0	0	50	20	
			11	*12*	*14*	*0*
Kirksville	0	0	0	33	50	44
	0	0	0	33	25	44
		17	*12*	*22*	*18*	*8*
Maryville	0	60	57	50	60	75
	0	40	23	25	20	15
		10	*16*	*8*	*12*	*9*
Springfield	0	0	67	71	75	80
	0	0	27	21	15	20
		15	*12*	*16*	*16*	*14*
Warrensburg	0	0	60	67	80	80
	0	0	20	33	20	20
		15	*20*	*21*	*41*	*30*
All Schools	0	0	50	57	71	75
	0	0	30	37	21	18
		87	*86*	*92*	*122*	*76*
Courtis Standards	..	57	77	87	90	91
Columbia, Mo.	..	33	33	75	78	..
		139	*114*	*124*	*119*	..
Piedmont, Mo.	..	0	25	67	50	71
		23	*25*	*48*	*28*	*18*
Excelsior Springs, Mo.	..	..	25	83	86	75

TABLE IX

STONE ARITHMETIC TESTS

Grade	3	4	5	6	7	8
Cape Giradeau	1.0	2.0	3.0	5.0	7.1	6.9
	1.0	1.0	1.0	2.0	1.0	3.1
	8	*13*	*15*	*13*	*22*	*16*
Columbia	1.0	2.5	4.6	4.6	5.0	. . .
	0.4	2.1	1.0	1.6	1.7	
	10	*18*	*11*	*14*	*11*	
Kirksville	0	1.0	1.0	4.0	5.2	4.0
	0	1.0	1.0	2.0	1.2	1.0
	15	*15*	*13*	*22*	*18*	*9*
Maryville	0	0.5	3.1	4.0	6.7	6.3
	0	0.5	2.0	1.2	0.7	1.3
	10	*10*	*16*	*8*	*12*	*10*
Springfield	1.0	2.0	3.6	4.6	6.8	6.8
	0.6	1.0	3.6	1.0	1.2	1.8
	16	*15*	*10*	*15*	*17*	*14*
Warrensburg	0	1.0	2.0	3.6	5.6	7.8
	0	1.0	1.0	1.8	2.0	1.4
	20	*15*	*20*	*21*	*41*	*32*
All Schools	1.0	1.6	3.0	4.0	6.4	7.0
	1.0	1.4	2.0	1.6	1.6	2.0
	79	*86*	*85*	*93*	*121*	*81*
Starch Standards*	4.5	6.2	7.8	9.4	11.0	12.6
Butte, Mont.	. .	. .	2.2	3.9	5.8	7.7
Laporte, Ind	. .	. .	3.4	4.6	8.1	8.6
Salt Lake City	. .	. .	3.7	6.4	8.6	10.5
			453	*468*	*409*	*284*
Boston, 1916	. .	. .	. .	4.4	5.6	7.6
				1.6	1.8	2.4
				1243	*1128*	*1065*
Brookline, Mass.	. .	. .	4.0	6.2	. .	. .
			1.4	2.0	. .	. .
			322	*325*		

*These scores are based on results from 2515 pupils in 18 schools.

TABLE X

SPELLING ("AYRES'" LISTS)

Grade	2	3	4	5	6	7	8
Cape Giradeau	76	84	82	85	80	83	82
	14	8	13	12	10	13	12
	21	*8*	*11*	*14*	*13*	*22*	*14*
Columbia	not	60	57	66	67	76	no
	given	17	25	21	25	11	8th
		10	*19*	*11*	*12*	*14*	grade
Kirksville	67	66	53	73	64	58	57
	22	20	29	20	19	24	21
	17	*14*	*16*	*10*	*24*	*18*	*8*
Maryville	97	93	73	80	76	76	90
	2	8	17	18	17	20	12
	6	*10*	*9*	*16*	*8*	*12*	*10*
Springfield	95	85	72	89	81	79	76
	5	8	15	8	15	17	19
	16	*16*	*14*	*12*	*16*	*17*	*14*
Warrensburg	82	65	58	76	79	71	77
	15	17	22	20	17	20	19
	15	*21*	*16*	*20*	*21*	*41*	*30*
All Schools	81	74	64	78	74	73	77
	17	15	23	18	18	19	16
	75	*79*	*85*	*83*	*94*	*124*	*76*
Standard	79	79	79	79	79	79	79

The above scores are average percentages, and the figures in the second line are the average deviations. The figures in italics indicate the number of pupils tested in each instance.

The words for these lists were so chosen that the standard accuracy is 79%. That is, an average of 79% must be obtained to equal the standard.

In correcting the papers, credit was given for accepted forms of simplified spelling and for wrong words correctly spelled.

TABLE XI

SPELLING ("BOSTON" LIST)

Grade	2	3	4	5	6	7	8
Cape Giradeau	57	65	66	57	55	62	64
	14	14	16	4	27	21	20
	21	*8*	*11*	*14*	*13*	*22*	*14*
Columbia	not	38	28	35	53	36	no
	given	14	18	19	33	16	8th
		10	*19*	*11*	*12*	*14*	grade
Kirksville	36	33	29	59	39	33	41
	24	20	22	21	24	23	14
	17	*14*	*16*	*10*	*24*	*18*	*8*
Maryville	73	59	38	57	59	37	54
	20	25	20	21	26	20	22
	6	*10*	*9*	*16*	*8*	*12*	*10*
Springfield	73	61	71	71	74	50	62
	18	16	14	18	18	21	22
	16	*16*	*14*	*12*	*16*	*17*	*14*
Warrensburg	59	47	31	65	60	43	56
	17	24	18	28	24	24	24
	15	*21*	*16*	*20*	*21*	*41*	*30*
All Schools	57	50	42	58	55	45	57
	21	22	24	23	26	24	18
	75	*79*	*85*	*83*	*94*	*124*	*76*

The above scores are average percentages, and the figures in the second line are average deviations. The figures in italics indicate the number of pupils tested in each instance.

The standard accuracy for these words ranges from 86% to 95%. These results, however, were obtained only after the words had been studied for one or two lessons. None of the schools tested had used these words.

TABLE XII

HOLMES PENMANSHIP TEST

Speed of Writing—4-Minute Test

Grade	2	3	4	5	6	7	8
Cape Giradeau	34	60	62	97	106	109	121
	6	8	10	8	8	9	9
	21	*8*	*13*	*15*	*13*	*22*	*16*
Columbia	31	25	52	86	90	87	
	4	5	12	11	12	17	
	11	*10*	*18*	*11*	*11*	*14*	*0*
Kirksville	20	39	59	64	75	76	64
	10	12	8	7	13	21	19
	18	*15*	*16*	*12*	*21*	*18*	*7*
Maryville	35	48	48	54	72	85	99
	10	18	13	9	10	20	10
	6	*10*	*10*	*16*	*8*	*12*	*10*
Springfield	44	62	73	80	94	94	99
	7	8	8	13	7	8	8
	15	*16*	*14*	*10*	*15*	*17*	*14*
Warrensburg	46	38	58	76	80	88	93
	13	10	8	15	14	11	9
	13	*21*	*15*	*20*	*21*	*41*	*31*
All Schools	34	45	58	76	84	90	98
	8	15	11	15	15	18	14
	84	*80*	*86*	*84*	*89*	*124*	*78*
Cleveland*	..	..	..	60	70	76	80
Starch Standards*	31	38	47	57	65	75	83
South Bend, Ind.*	..	45	50	55	60	65	70
Newton, Mass.	39	55	59	73	85	94	102

*The tests given in these cases were not the Holmes tests, but were so like them that the results are comparable.

TABLE XIII

HOLMES PENMANSHIP TEST

Average Speed in 1 and 4 Minute Tests

Grade	2	3	4	5	6	7	8
Cape Giradeau	38	66	75	100	112	111	127
	5	3	7	5	7	9	15
	20	*8*	*13*	*15*	*13*	*22*	*16*
Columbia	35	32	51	87	89	92	
	4	12	10	11	13	12	
	11	*10*	*17*	*11*	*11*	*14*	*0*
Kirksville	31	39	59	69	83	71	87
	12	9	14	9	7	12	28
	11	*15*	*15*	*12*	*21*	*17*	*6*
Maryville	39	54	51	55	83	89	101
	4	12	9	9	16	18	9
	6	*10*	*10*	*16*	*8*	*12*	*10*
Springfield	44	69	75	97	110	96	106
	4	11	9	12	8	9	9
	14	*16*	*14*	*10*	*15*	*17*	*14*
Warrensburg	45	44	60	79	82	92	92
	9	7	10	18	19	8	10
	13	*21*	*15*	*20*	*21*	*41*	*31*
All Schools	40	49	62	80	92	92	102
	6	15	12	19	16	13	16
	75	*80*	*84*	*84*	*89*	*123*	*77*
Newton, Mass.	39	55	59	73	85	94	102
Brookline, Mass.	..	..	..	76	87	90	98
				10	9	13	13
				324	*330*	*309*	*273*

TABLE XIV

HOLMES PENMANSHIP TEST

Quality of Handwriting in Speed Test

Grade	2	3	4	5	6	7	8
Cape Giradeau	30	33	35	30	30	40	38
	3	5	3	3	3	5	3
	22	*6*	*13*	*15*	*13*	*22*	*16*
Columbia	48	45	45	43	42	46	
	5	9	3	4	4	6	
	11	*10*	*18*	*11*	*11*	*14*	*0*
Kirksville	33	33	35	35	35	36	33
	5	7	7	5	8	9	5
	19	*15*	*16*	*12*	*22*	*18*	*9*
Maryville	32	40	38	40	43	38	45
	3	7	8	10	7	7	10
	6	*10*	*10*	*16*	*8*	*12*	*10*
Springfield	30	25	26	33	36	33	38
	6	5	3	5	4	7	8
	16	*16*	*14*	*10*	*15*	*17*	*14*
Warrensburg	38	40	42	45	45	48	45
	7	5	6	5	7	7	5
	15	*21*	*15*	*20*	*21*	*41*	*31*
All Schools	33	35	35	38	38	43	42
	5	7	7	7	7	9	7
	89	*80*	*76*	*84*	*90*	*124*	*80*
Cleveland	..	..	..	45	48	50	55
Starch Standards	27	33	37	43	47	53	57
South Bend, Ind.	..	40	40	50	50	60	60
Newton, Mass	54	50	45	48	51	50	53

TABLE XV

HOLMES PENMANSHIP TEST

Quality of Handwriting in Dictation Test

Grade	2	3	4	5	6	7	8
Cape Giradeau	35	38	47	53	48	53	60
	7	5	7	5	2	7	7
	22	*8*	*13*	*15*	*13*	*22*	*16*
Columbia	45	47	42	43	47	55	
	3	7	5	3	6	10	
	12	*10*	*18*	*11*	*11*	*14*	
Kirksville	35	30	43	38	40	40	45
	5	3	5	5	5	7	5
	18	*15*	*16*	*12*	*24*	*18*	*9*
Maryville	27	38	38	38	48	40	58
	2	5	3	5	6	5	13
	6	*10*	*10*	*16*	*8*	*12*	*10*
Springfield	35	30	35	37	43	43	55
	5	3	3	5	6	7	12
	16	*16*	*14*	*10*	*15*	*17*	*14*
Warrensburg	37	40	45	53	50	55	50
	3	5	3	7	8	7	5
	15	*21*	*14*	*20*	*21*	*39*	*31*
All Schools	35	35	40	43	45	50	52
	7	7	5	8	7	10	8
	89	*80*	*75*	*84*	*92*	*122*	*80*

TABLE XVI

HOLMES PENMANSHIP TEST

Quality of Handwriting in Reproduction Test

Grade	2	3	4	5	6	7	8
Cape Giradeau	30	35	40	40	45	43	45
	3	3	7	3	7	5	7
	22	*8*	*12*	*15*	*12*	*21*	*16*
Columbia	52	38	48	47	45	48	
	3	6	5	7	3	5	
	12	*10*	*17*	*11*	*12*	*13*	*0*
Kirksville	33	38	38	36	40	40	53
	5	7	5	6	5	10	5
	12	*14*	*16*	*10*	*23*	*14*	*5*
Maryville	38	38	38	43	50	35	57
	5	5	10	7	7	10	15
	6	*10*	*10*	*16*	*8*	*12*	*10*
Springfield	37	28	38	40	47	42	43
	5	5	5	7	5	4	10
	14	*15*	*14*	*12*	*16*	*17*	*14*
Warrensburg	35	38	40	43	48	50	45
	5	5	3	7	8	5	5
	16	*21*	*15*	*20*	*21*	*41*	*32*
All Schools	35	35	40	42	45	45	45
	5	5	5	6	7	7	7
	82	*78*	*74*	*84*	*92*	*118*	*77*

TABLE XVII

HOMLES PENMANSHIP TEST

Average Quality of Handwriting

Grade	2	3	4	5	6	7	8
Cape Giradeau	33	36	43	39	42	47	47
	5	3	5	4	4	5	4
	22	*8*	*12*	*15*	*13*	*22*	*16*
Columbia	50	42	46	43	44	49	
	4	6	5	3	6	4	
	12	*10*	*18*	*11*	*11*	*14*	*0*
Kirksville	35	32	39	36	38	35	42
	3	6	4	5	4	5	7
	18	*15*	*16*	*12*	*22*	*18*	*9*
Maryville	32	41	38	43	45	37	54
	4	5	6	7	9	7	9
	6	*10*	*10*	*16*	*8*	*12*	*10*
Springfield	34	29	33	36	43	40	44
	4	3	4	6	5	4	9
	16	*16*	*14*	*10*	*15*	*17*	*14*
Warrensburg	35	39	43	48	47	51	45
	1	4	4	8	9	6	4
	15	*21*	*15*	*20*	*21*	*41*	*31*
All Schools	35	36	39	41	42	45	47
	6	6	6	5	5	8	6
	89	*80*	*75*	*84*	*90*	*124*	*80*
Newton, Mass.	54	50	45	48	51	50	53
Starch Standards	27	33	37	43	47	53	57
South Bend, Ind	..	40	40	50	50	60	60
Cleveland	..	..	..	45	48	50	55

TABLE XVIII

COMPARISON OF QUALITY OF PENMANSHIP ON DIFFERENT TESTS

Grade	2	3	4	5	6	7	8
Grade Medians in							
1. Speed Test							
	33	35	35	38	38	43	42
	5	7	7	7	7	9	7
	89	*80*	*76*	*84*	*90*	*124*	*80*
2. Dictation Test							
	35	35	40	43	45	50	52
	7	7	5	8	7	10	8
	89	*80*	*75*	*84*	*92*	*122*	*80*
3. Reproduction							
	35	35	40	42	45	45	45
	5	5	5	6	7	7	7
	82	*78*	*74*	*84*	*92*	*118*	*77*
4. Average of Three Tests							
	35	36	39	41	42	45	47
	5	6	6	5	5	8	6
	89	*80*	*75*	*84*	*90*	*124*	*80*

TABLE XIX

KANSAS SILENT READING TEST

Grade	3	4	5	6	7	8
Cape Giradeau	18.1	16.3	23.8	10.6	30.0	23.7
	9.5	4.6	4.8	2.4	4.2	7.5
	8	*13*	*14*	*13*	*21*	*15*
Columbia	6.8	12.4	16.3	15.4	16.3	
	3.0	5.2	4.4	4.6	5.1	
	10	*19*	*11*	*12*	*14*	*0*
Kirksville	5.2	9.8	12.8	16.8	19.3	9.5
	2.1	3.0	5.8	3.3	7.1	1.0
	14	*13*	*11*	*18*	*16*	*3*
Maryville	7.2	8.5	14.6	11.7	15.8	14.1
	3.2	4.5	7.3	2.1	4.1	0.7
	10	*9*	*16*	*8*	*12*	*8*
Springfield	10.5	13.4	18.3	13.5	17.3	18.4
	4.0	1.5	3.3	3.9	6.3	3.9
	15	*15*	*12*	*16*	*17*	*14*
Warrensburg	10.3	10.3	12.5	12.9	20.1	18.7
	6.0	3.9	3.8	2.5	4.3	5.8
	20	*15*	*19*	*21*	*41*	*28*
All Schools	8.5	12.4	16.3	13.2	20.0	18.4
	4.3	4.9	5.3	3.8	6.2	5.3
	77	*84*	*83*	*88*	*121*	*68*
Scores in 19 cities	6.0	9.9	13.7	13.4	16.5	18.8
	1207	*1473*	*1535*	*1264*	*1338*	*912*

TABLE XX

RATE OF SILENT READING

Judd Material*

Grade	2	3	4	5	6	7	8
Cape Giradeau	79	250	127	184	193	298	309
	3	78	28	62	45	32	12
	22	*8*	*12*	*15*	*13*	*21*	*16*
Columbia	133	189	156	184	272	236	
	60	51	57	32	48	49	
	12	*10*	*19*	*11*	*14*	*12*	*0*
Kirksville	102	144	154	213	210	198	261
	52	70	57	12	35	36	60
	14	*13*	*16*	*10*	*22*	*16*	*4*
Maryville	107	149	188	169	237	212	219
	43	60	60	54	57	47	54
	6	*10*	*10*	*16*	*8*	*12*	*10*
Springfield	122	172	201	251	241	184	200
	43	50	41	28	44	30	45
	16	*15*	*14*	*12*	*16*	*16*	*13*
Warrensburg	99	148	176	216	192	212	209
	51	65	80	51	58	50	45
	15	*21*	*15*	*20*	*20*	*41*	*26*
All Schools	104	169	166	202	216	224	235
	50	66	57	51	53	53	56
	85	*77*	*86*	*84*	*95*	*118*	*69*
Cleveland†	114	159	165	165	179	168	187
Standard Rates‡	90	138	132	154	167	161	172

The above scores are the average rates of silent reading expressed in number of words read per minute. The figures in the second line are the average deviations.

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*This material was not used with the separate individuals as in the Cleveland Survey, but the test was given like the Holmes Test to the whole class. The results are, therefore, not exactly comparable.

†These figures estimated from diagram p. 152 of Measuring the Work of the Public Schools. Figures are averages obtained from scores of 1831 Cleveland pupils.

‡These scores are given on the Score Sheet for Reading published by the School of Education at the University of Chicago. They are also on the diagram referred to on page (21). They include scores of 2654 pupils in 13 cities.

TABLE XXI

HOLMES READING TEST

Speed of Silent Reading

Grade	2	3	4	5	6	7	8
Cape Giradeau	147	384	237	222	234	463	444
	60	180	30	42	57	100	81
	22	*8*	*12*	*15*	*13*	*20*	*15*
Columbia	186	147	219	309	327	324	
	96	33	54	33	97	39	
	12	*10*	*19*	*11*	*12*	*13*	*0*
Kirksville	126	207	180	321	264	276	366
	21	90	60	74	57	68	21
	19	*13*	*16*	*10*	*23*	*16*	*3*
Maryville	180	180	405	363	363	291	309
	30	66	153	96	81	72	75
	6	*10*	*10*	*15*	*8*	*12*	*10*
Springfield	138	237	188	363	276	237	276
	24	123	44	84	45	51	86
	15	*15*	*14*	*12*	*16*	*17*	*14*
Warrensburg	141	180	147	299	249	309	384
	63	33	24	67	42	72	123
	15	*21*	*15*	*20*	*20*	*41*	*28*
All Schools	147	198	198	309	276	318	363
	39	84	51	84	60	81	86
	89	*77*	*86*	*83*	*92*	*119*	*70*
Brookline, Mass				249	283	309	294
				69	80	63	69
				326	*339*	*313*	*273*
Fall River, Mass.					270	309	
					75	72	
					352	*312*	

TABLE XXII

HOLMES READING TEST

Reproduction of Story Read by Pupils

Grade	2	3	4	5	6	7	8
Cape Giradeau	14	66	60	63	63	69	66
	9	17	11	6	11	8	11
	22	*8*	*12*	*15*	*12*	*21*	*16*
Columbia	29	37	29	57	49	57	
	12	9	14	9	6	11	
	12	*10*	*17*	*11*	*12*	*13*	*0*
Kirksville	11	43	40	51	60	63	
	8	20	17	9	11	6	
	10	*12*	*16*	*10*	*23*	*14*	*0*
Maryville	41	29	43	51	57	57	63
	17	16	11	5	12	9	11
	8	*10*	*10*	*15*	*8*	*12*	*10*
Springfield	26	49	54	49	57	54	54
	9	17	6	6	9	11	12
	14	*15*	*14*	*12*	*16*	*17*	*14*
Warrensburg	14	29	43	51	51	57	57
	8	12	9	11	12	6	11
	14	*21*	*15*	*20*	*20*	*41*	*28*
All Schools	20	37	43	51	54	60	60
	11	14	14	8	9	11	11
	78	*76*	*84*	*83*	*85*	*118*	*68*
Brookline, Mass.				57	57	57	60
				9	9	9	9
				317	*329*	*312*	*266*
Fall River, Mass.					54	57	..
					9	9	
					352	*312*	

TABLE XXIII

HOLMES READING TEST

Questions on Story Read by Pupil

Grade	2	3	4	5	6	7	8
Cape Giradeau	39	71	77	73	77	85	77
	14	9	7	7	5	4	11
	12	*8*	*12*	*15*	*12*	*21*	*16*
Columbia	53	53	44	68	70	73	
	4	4	11	5	7	5	
	12	*10*	*17*	*11*	*12*	*13*	*0*
Kirksville	19	39	49	64	69	68	83
	19	15	8	10	8	14	6
	19	*12*	*15*	*10*	*22*	*17*	*3*
Maryville	44	49	54	69	72	69	72
	6	11	11	12	7	14	15
	6	*10*	*10*	*14*	*8*	*12*	*10*
Springfield	38	59	68	77	78	77	82
	9	5	10	14	5	8	12
	16	*15*	*14*	*12*	*16*	*17*	*14*
Warrensburg	19	44	44	72	68	68	72
	15	5	9	13	15	9	8
	15	*21*	*15*	*20*	*20*	*41*	*27*
All Schools	37	50	52	69	72	72	75
	16	12	15	8	7	11	10
	90	*76*	*83*	*82*	*90*	*121*	*70*
Brookline, Mass.				62	64	68	73
				11	11	9	9
				325	*340*	*313*	*274*
Fall River, Mass.					66	69	
					11	9	
					352	*312*	

TABLE XXIV

HOLMES READING TEST

Reproduction of Story Read to Pupils

Grade	2	3	4	5	6	7	8
Cape Giradeau	17	46	51	54	57	74	69
	11	15	5	8	6	9	12
	22	*8*	*11*	*14*	*13*	*22*	*14*
Columbia	26	37	46	57	71	60	..
	6	12	11	11	8	9	
	11	*9*	*19*	*11*	*12*	*14*	*0*
Kirksville	..	14	43	34	51	60	51
		8	12	0	5	14	8
		16	*17*	*13*	*25*	*19*	*8*
Maryville	40	43	46	46	54	60	54
	11	6	11	8	6	6	11
	6	*10*	*9*	*16*	*8*	*12*	*8*
Springfield	29	49	51	51	60	60	66
	9	8	2	3	9	6	8
	16	*12*	*13*	*12*	*16*	*17*	*14*
Warrensburg	26	34	40	54	54	57	63
	20	12	9	11	9	11	11
	15	*21*	*15*	*20*	*21*	*41*	*30*
All Schools	26	40	49	51	57	60	63
	11	11	8	9	7	9	9
	70	*68*	*73*	*78*	*78*	*112*	*70*

The above scores are in median per cents and the figures in the second line are the median deviations.

No standards for comparison are available, as this test has not been given previously. It was given to determine whether children can remember better what they hear or what they read. See Table XXXV for comparisons.

TABLE XXV

HOLMES READING TEST

Questions on Story Read to Pupils

Grade	2	3	4	5	6	7	8
Cape Giradeau	31	66	75	74	71	85	86
	14	8	10	11	9	5	6
	21	*8*	*12*	*14*	*13*	*22*	*14*
Columbia	48	62	60	70	83	76	
	10	6	10	5	4	4	
	11	*9*	*19*	*10*	*12*	*14*	*0*
Kirksville	..	37	62	67	68	67	78
		17	20	2	12	8	3
	0	*16*	*17*	*13*	*25*	*19*	*4*
Maryville	53	47	64	66	74	79	79
	22	16	23	5	8	8	9
	6	*10*	*9*	*16*	*8*	*12*	*8*
Springfield	48	65	69	85	85	86	88
	9	5	5	5	4	6	8
	16	*12*	*13*	*12*	*16*	*17*	*14*
Warrensburg	23	48	49	67	75	77	76
	15	13	17	7	7	7	7
	15	*21*	*15*	*20*	*21*	*41*	*30*
All Schools	37	54	66	69	75	79	80
	14	13	11	7	8	7	7
	69	*68*	*74*	*77*	*78*	*112*	*70*

The above scores are in median per cents and the figures in the second line are the median deviations.

No standards for comparison are available, as this test has not been given previously. It was given to determine whether children can remember better what they hear or what they read. See Table XXXVI for comparisons.

TABLE XXVI

HOLMES READING TEST

Comparison of Reproductions of Stories Read by and Read to Pupils

Grade	2		3		4		5		6		7		8	
	Read by	Read to	Read by	Read to	Read by	Read to	Read by	Read to	Read by	Read to	Read by	Read to	Read by	Read to
Cape Giradeau	14	17	66	46	60	51	63	54	63	57	69	74	66	69
	9	11	17	15	11	5	6	8	11	6	8	9	11	12
Columbia	29	27	37	37	29	46	57	57	40	71	57	69	no pupils	
	12	6	9	12	14	11	9	11	6	8	11	9		
Kirksville	11	no	43	14	40	43	51	34	60	51	63	60	no pupils	
	8	pupils	20	12	17	12	9	0	11	5	6	14		
Maryville	41	40	29	43	43	46	51	46	57	54	59	60	63	54
	17	11	16	6	11	11	5	8	8	6	7	6	11	11
Springfield	26	29	49	49	54	51	49	51	57	60	54	60	54	66
	9	9	17	8	6	2	6	3	9	9	11	6	12	8
Warrensburg	14	26	29	34	43	40	51	54	51	54	57	57	57	63
	8	20	12	12	9	9	11	11	12	9	6	11	11	11
All Schools	20	26	37	40	43	49	51	51	54	57	60	60	60	60
	11	11	14	11	14	8	8	9	9	7	11	9	11	9

Scores are median percentages with median deviations beneath in second line

TABLE XXVII

HOLMES READING TEST

Comparison of Answers to Questions on Stories Read by and Read to Pupils

Grade	2		3		4		5		6		7		8	
	Read by	Read to	Read by	Read to	Read by	Read to	Read by	Read to	Read by	Read to	Read by	Read to	Read by	Read to
Cape Giradeau	39	31	71	66	77	75	73	74	77	71	85	85	77	86
	17	14	9	8	7	10	7	11	5	9	4	5	11	6
Columbia	53	48	53	62	44	60	68	70	70	83	73	76	..	..
	4	10	4	6	11	10	5	5	7	4	5	4	..	..
Kirksville	19	..	39	37	49	62	64	67	69	68	68	67	83	80
	19	..	15	17	8	20	10	2	8	12	14	8	6	5
Maryville	44	53	49	47	54	64	69	66	72	74	69	79	72	79
	6	22	11	16	11	23	12	5	7	8	14	8	15	9
Springfield	38	48	59	65	68	69	77	85	78	85	78	86	82	88
	9	9	5	5	10	5	14	5	5	4	8	6	12	8
Warrensburg	19	23	44	48	44	49	72	67	68	75	68	77	72	76
	15	15	5	13	9	17	13	7	15	7	9	7	8	7
All Schools	37	37	50	54	52	66	69	69	72	75	72	79	75	80
	16	14	12	13	15	11	8	7	7	8	11	7	10	7

Scores are median percentages with median deviations beneath in second line

TABLE XXVIII
COMPOSITIONS

Grade	6	7	8
Cape Giradeau	..	74	75
		9	8
		21	*15*
Columbia	..	70	..
		9	
		14	
Kirksville	..	64	72
		5	8
		16	*4*
Maryville	..	67	69
		7	9
		12	*9*
Springfield	..	75	75
		3	8
		17	*14*
Warrensburg	..	57	65
		6	9
		35	*29*
All Schools	..	67	70
		8	10
		115	*70*
Bloomington, Ind.*	..	61	67
		8	8
		139	*129*
Port Townsend, Wash.	..	53	58
Newton, Mass.	..	..	75
			25
Brookline, Mass.	61	..	70
	6		7
	330		*278*

*These medians and variations were found by combining the scores of the A and B divisions of the grades in Bloomington. See Report of Second Indiana Conference on Educational Measurements, p. 117ff.

EXPLANATION OF ABBREVIATIONS USED IN PROGRESS TABLES on the Following Pages

(a) Courtis Addition
(b) Courtis Subtraction
(c) Courtis Multiplication
(d) Courtis Division
(e) Stone Arithmetic
(f) Ayres' Spelling
(g) Speed of Penmanship
(h) Quality of Penmanship
(i) Kansas Silent Reading
(j) Speed of Silent Reading
(k) Quality of Reproduction
(l) Answers to Questions on Story Read

TABLE XXIX

PROGRESS IN WHOLE GROUP

Grade	2	3	4	5	6	7	8
(a)*	..	3–0	4–1	6–2	6–2	7–4	8–4
		1–0	1–1	1–2	1–2	1–2	1–2
(b)*	..	2–0	4–1	6–4	6–3	8–6	10–6
		1–0	1–1	1–2	2–2	2–2	2–2
(c)*	..	"O"	2–0	5–3	5–2	6–4	9–4
			2–0	1–2	2–2	2–2	2–2
(d)*	..	"O"	1–0	4–1	4–2	5–3	8–6
			1–0	1–1	2–2	2–2	3–2
(e)	..	1.0	1.6	3.0	4.0	6.4	7.0
		1.0	1.4	2.0	1.6	1.6	2.0
(f)	81	74	64	78	74	73	77
	17	15	23	18	18	19	16
(g)	40	49	62	80	92	92	102
	6	15	12	19	16	13	16
(h)	35	36	39	41	42	45	47
	6	6	6	5	5	8	6
(i)	..	8.5	12.4	16.3	13.2	20.0	18.4
		4.3	4.9	5.3	3.8	6.2	5.3
(j)	147	198	198	309	276	318	368
	39	84	51	84	60	81	86
(k)	20	37	43	51	54	60	60
	11	14	14	8	8	11	11
(l)	37	50	52	69	72	72	75
	16	12	15	8	7	11	10

*The figure at the left of the dash shows the median number of examples attempted, the figure after the dash shows the median number of examples right.

TABLE XXX

PROGRESS IN CAPE GIRADEAU

	Grade 2	3	4	5	6	7	8	Score in
(a)	..	3–0	4–0	6–3	8–3	8–5	9–7	
		1–0	1–2	1–1	2–3	2–2	2–2	
		9	*12*	*15*	*13*	*21*	*15*	
(b)	..	3–0	4–2	8–5	8–5	8–7	9–6	Number
		1–0	1–1	1–1	2–3	2–2	2–2	of
(c)	..	1–0	3–0	5–3	8–4	7–4	10–6	Examples
		1–0	2–0	1–1	1–2	2–2	1–2	
(d)	..	"0"	1–0	4–1	5–3	5–4	8–7	
			1–0	1–1	3–2	2–2	4–4	
(e)	..	1.0	2.0	3.0	5.0	7.1	6.9	Assigned
		1.0	1.0	1.0	2.0	1.0	3 1	values
		8	*13*	*15*	*13*	*22*	*16*	
(f)	76	84	82	85	80	83	82	Percent.
	14	8	13	12	10	13	12	
	21	*8*	*11*	*14*	*13*	*22*	*14*	
(g)	38	66	75	100	112	111	127	Letters
	5	3	7	5	7	9	15	per
	20	*8*	*13*	*15*	*13*	*22*	*16*	minute
(h)	33	36	43	39	42	47	47	Grade on
	5	3	5	4	4	5	4	Ayres'
	22	*8*	*12*	*15*	*13*	*22*	*16*	Scale
(i)	..	18.1	16.3	23.8	10.6	30.0	23.7	Assigned
		9.5	4.6	4.8	2.4	4.2	7.5	values
		8	*13*	*14*	*13*	*21*	*15*	
(j)	147	384	237	222	234	463	444	Words
	60	180	30	42	57	100	81	per
	22	*8*	*12*	*15*	*13*	*20*	*15*	minute
(k)	14	66	60	63	63	69	66	Percent.
	9	17	11	6	11	8	11	
	12	*8*	*12*	*15*	*12*	*21*	*16*	
(l)	39	71	77	73	77	85	77	Percent.
	14	9	7	7	5	4	11	
	22	*8*	*12*	*15*	*12*	*21*	*16*	

TABLE XXXI

PROGRESS IN COLUMBIA

Grade	2	3	4	5	6	7	8
(a)	..	2–0	3–0	5–2	7–2	6–4	
		1–0	1–0	1–1	2–1	2–1	
		10	*18*	*11*	*12*	*14*	
(b)	..	1–0	1–0	4–2	6–3	7–6	
		1–0	1–0	1–1	2–2	1–1	
(c)	..	"0"	1–0	1–0	3–0	4–2	
			0–0	0–0	1–0	1–2	
(d)	..	"0"	"0"	1–0	2–1	5–2	
				"0"–"0"	1–1	2–1	
(e)	..	1.0	2.5	4.6	4.6	5.0	
		0.4	2.1	1.0	1.6	1.7	
		10	*18*	*11*	*14*	*11*	
(f)	..	60	57	66	67	76	
		17	25	21	25	11	
		10	*19*	*11*	*12*	*14*	
(g)	35	32	51	87	89	92	
	4	12	10	11	13	12	
	11	*15*	*15*	*12*	*21*	*17*	
(h)	50	42	46	43	44	49	
	4	6	5	3	6	4	
	12	*10*	*18*	*11*	*11*	*14*	
(i)	..	6.8	12.4	16.3	15.4	16.3	
		3.0	5.2	4.4	4.6	5.1	
		10	*19*	*11*	*12*	*14*	
(j)	186	147	219	309	327	324	
	96	33	54	33	97	39	
	12	*10*	*19*	*11*	*12*	*13*	
(k)	29	37	29	57	49	57	
	12	9	14	9	6	11	
	12	*10*	*17*	*11*	*12*	*13*	
(l)	53	53	44	68	70	73	
	4	4	11	5	7	5	
	12	*10*	*17*	*11*	*12*	*13*	

No eighth grade in this school

TABLE XXXII

PROGRESS IN KIRKSVILLE

Grade	2	3	4	5	6	7	8
(a)	..	4–1	4–1	5–1	6–2	6–2	10–1
		1–0	1–0	1–1	2–1	2–2	4–1
		16	*17*	*12*	*22*	*18*	*8*
(b)	..	1–0	4–0	6–2	5–1	6–3	8–3
		1–0	1–0	3–2	1–1	2–2	2–1
(c)	..	"0"	1–0	3–1	3–0	6–2	10–0
			1–0	2–1	1–0	1–1	3–0
(d)	..	"0"	1–0	2–0	3–1	4–2	4–1
			1–0	1–0	2–1	1–1	4–1
(e)	..	0	1.0	1.0	4.0	5.2	4.0
		0	1.0	1.0	2.0	1.2	1.0
		15	*15*	*13*	*22*	*18*	*9*
(f)	67	66	53	73	64	58	57
	22	20	29	20	19	24	21
	17	*14*	*16*	*10*	*24*	*18*	*8*
(g)	31	39	59	69	83	71	87
	12	9	14	9	7	12	28
	11	*15*	*15*	*12*	*21*	*17*	*6*
(h)	35	32	39	36	38	35	42
	3	6	4	5	4	5	7
	18	*15*	*16*	*12*	*22*	*18*	*9*
(i)	..	5.2	9.8	12.8	16.8	19.3	9.5
		2.1	3.0	5.8	3.3	7.1	1.0
		14	*13*	*11*	*18*	*16*	*3*
(j)	126	207	180	321	264	276	366
	21	90	60	74	57	68	21
	19	*13*	*16*	*10*	*23*	*16*	*3*
(k)	11	43	40	51	60	63	no
	8	20	17	9	11	6	pupils
	19	*12*	*15*	*10*	*22*	*17*	
(l)	19	39	49	64	69	68	83
	19	15	8	10	8	14	6
	19	*12*	*15*	*10*	*22*	*17*	*3*

TABLE XXXIII

PROGRESS IN MARYVILLE

Grade	2	3	4	5	6	7	8
(a)	..	5–1	6–4	6–4	7–5	8–3	8–5
		1–1	1–2	1–2	2–2	1–1	1–1
		9	*12*	*15*	*13*	*21*	*15*
(b)	..	2–0	5–4	6–4	9–5	9–6	10–7
		1–0	2–1	1–2	2–2	1–2	1–1
(c)	..	3–0	5–1	5–3	7–4	8–5	8–3
		1–0	1–2	1–1	2–1	1–2	2–2
(d)	..	"0"	3–1	4–2	5–3	6–3	6–4
			2–1	1–1	3–2	1–1	2–1
(e)	..	0	0.5	3.1	4.0	6.7	6.3
		0	0.5	2.0	1.2	0.7	1.3
		10	*10*	*16*	*8*	*12*	*10*
(f)	97	93	73	80	76	76	90
	2	8	17	18	17	20	12
	6	*10*	*9*	*16*	*8*	*12*	*10*
(g)	39	54	51	55	83	89	101
	4	12	9	9	16	18	9
	6	*10*	*10*	*16*	*8*	*12*	*10*
(h)	32	41	38	43	45	37	42
	4	5	6	7	9	7	7
	6	*10*	*10*	*16*	*8*	*12*	10
(i)	..	7.2	8.5	14.6	11.7	15.8	14.1
		3.2	4.5	7.3	2.1	4.1	0.7
		10	*9*	*16*	*8*	*12*	*8*
(j)	180	180	405	363	363	291	309
	30	66	153	96	81	72	75
	6	*10*	*10*	*15*	*8*	*12*	*10*
(k)	41	29	43	51	57	57	63
	17	16	11	5	12	9	11
	8	*10*	*10*	*15*	*8*	*12*	*10*
(l)	44	49	54	69	72	69	72
	6	11	11	12	7	14	15
	6	*10*	*10*	*14*	*8*	*12*	*10*

TABLE XXXIV

PROGRESS IN SPRINGFIELD

Grade	2	3	4	5	6	7	8
(a)	..	2–0	4–1	6–3	6–4	6–4	8–3
		1–0	1–1	2–2	2–2	1–1	2–2
		14	*15*	*12*	*16*	*16*	*14*
(b)	..	4–1	4–1	7–5	8–6	8–5	10–6
		1–1	1–1	0–2	2–2	2–2	2–2
(c)	..	"0"	3–1	5–4	8–5	6–3	8–4
			1–1	1–1	2–1	1–1	3–2
(d)	..	"0"	2–0	3–2	6–4	5–4	9–7
			0–0	1–1	1–2	1–1	1–2
(e)	..	1.0	2.0	3.6	4.6	6.8	6.8
		0.6	1.0	3.6	1.0	1.2	1.8
		16	*15*	*10*	*15*	*17*	*14*
(f)	95	85	72	89	81	79	76
	5	8	15	8	15	17	19
	16	*16*	*14*	*12*	*16*	*17*	*14*
(g)	44	69	75	97	110	96	106
	4	11	9	12	8	9	9
	14	*16*	*14*	*10*	*15*	*17*	*14*
(h)	34	29	33	36	43	40	44
	4	3	4	6	5	4	9
	16	*16*	*14*	*10*	*15*	*17*	*14*
(i)	..	10.5	13.4	18.3	13.5	17.3	18.4
		4.0	1.5	3.3	3.9	6.3	3.9
		15	*15*	*12*	*16*	*17*	*14*
(j)	138	237	188	363	276	237	276
	24	123	44	84	45	51	86
	15	*15*	*14*	*12*	*16*	*17*	*14*
(k)	26	49	54	49	57	54	54
	9	17	6	6	9	11	12
	14	*15*	*14*	*12*	*16*	*17*	*14*
(l)	38	59	68	77	78	78	82
	9	5	10	14	5	8	12
	15	*15*	*14*	*12*	*16*	*17*	*14*

TABLE XXXV

PROGRESS IN WARRENSBURG

Grade	2	3	4	5	6	7	8
(a)	..	3–0	5–1	6–3	6–2	8–4	8–4
		1–0	1–1	1–2	1–2	1–2	1–2
		20	*15*	*20*	*21*	*41*	*30*
(b)	..	3–0	4–2	7–4	5–3	9–7	10–7
		1–0	1–1	1–1	1–1	2–2	2–2
(c)	..	"0"	3–0	6–3	5–2	7–4	9–5
			1–0	1–2	2–2	1–2	2–2
(d)	..	"0"	2–0	5–3	4–2	6–4	7–6
			1–0	2–2	1–1	2–2	2–2
(e)	..	0	1.0	2.0	3.6	5.6	7.8
		0	1.0	1.0	1.8	2.0	1.4
		20	*15*	*20*	*21*	*41*	*32*
(f)	82	65	58	76	79	71	77
	15	17	22	20	17	20	19
	15	*21*	*16*	*20*	*21*	*41*	*30*
(g)	45	44	60	79	82	92	102
	9	7	10	18	19	8	16
	13	*21*	*15*	*20*	*21*	*41*	*31*
(h)	35	39	43	48	47	51	45
	1	4	4	8	9	6	4
	15	*21*	*15*	*20*	*21*	*41*	*31*
(i)	..	10.3	10.3	12.5	12.9	20.1	18.7
		6.0	3.9	3.8	2.5	4.3	5.8
		20	*15*	*19*	*21*	*41*	*28*
(j)	141	180	147	299	249	309	384
	63	33	24	67	42	72	123
	15	*21*	*15*	*20*	*20*	*41*	*28*
(k)	14	29	43	51	51	57	57
	8	12	9	11	12	6	11
	14	*21*	*15*	*20*	*20*	*41*	*28*
(l)	19	44	44	72	68	68	72
	15	5	9	13	15	9	8
	15	*21*	*15*	*20*	*20*	*41*	*29*

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